The Chemical Age

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Notes and Comments

The Rayon Industry

THE survey of the present state of the rayon industry which Mr. Samuel Courtauld presented at the annual meeting of Courtaulds, Ltd., last week, contains many important observations for those who are interested in that industry as manufacturers, users or investors. At a time when most industries are depressed it is encouraging to read that Courtaulds' business has increased to such an extent during the past year that all the available machinery has been brought into operation. As Mr. Courtauld remarked, this full-time running, combined with improved methods of production and organisation, has been of inestimable advantage. By thus reducing the cost of manufacture the company has not only marketed rayon at a profit but, as was announced a few weeks ago, has benefited its customers by an all-round reduction in prices. Although it is worthy of note that the world production of rayon for 1933 was 27 per cent. in advance of the previous record, it is even more noteworthy that there was no marked over-production; in fact, for the first time for some years the supply and the demand were about equal. Production in England, last year, was 84,000,000 lb., compared with 72,000,000 lb. in 1932—an increase which was far below the level reached in the United States and in Japan.

Standardisation of Rayon Yarns

WITH an output of 96,000,000 lb., Japan has become second largest producer in the world. As that country has planned a further large increase for the current year, British producers can scarcely be expected to view the situation with equanimity, for it is becoming more and more difficult for our manufacturers to enter the world markets on a reasonable competitive basis. It is common knowledge that long working days, extremely low wages, and the inflation of the yen have all contributed to the capture of the markets. At the same time British producers cannot afford to ignore certain factors over which they have considerable control; and among these is the standardisation of rayon yarns, about which Mr. Courtauld made some pertinent remarks. Hitherto, the English manufacturer has offered these yarns to the trade in a far greater variety in proportion to the consumption than has been offered elsewhere, resulting in an excessive sub-division of production that has driven up the cost to a serious extent. As Mr. Courtauld indicated, there is really little sense or reason in pursuing this policy, for the slight differences in counts and finishes of yarn are not visible in the finished fabric. The origin of these differences can be traced to individual requests which could have been modified at the outset had producers and users realised the importance of the question; and since the extra burden of cost (which is inseparable from excessive variety) has been a heavy handicap to the British user in the past, any economies that can be effected by further standardisation should help the user in his struggle with foreign competitors.

It is quite evident from Mr. Courtauld's speech that the company intends to do its utmost to reduce the cost of production without detriment to its employees; to extend the consumption of rayon; and to avoid increasing its margin of profit in order to prevent a renewal of excessive competition. Mr. Courtauld repudiates the suggestion that the company is trying to create a monopoly with the idea of subsequently raising prices and at the same time lowering wages.

The Allocation of Profits

A POINT of interest to the business world, and perhaps peculiarly to the chemical industry, was also raised by Mr. Courtauld. Shareholders are entitled to reasonable profits on their investments, though there is difference of opinion upon the interpretation of the word "reasonable." Let us agree that every investor is entitled to 5 per cent. on the capital he has invested, assuming that the company is able to earn that amount. Let us also agree that the investor who puts his money into a new concern is worth more than that modest sum, which should be considered as the just return from an established and "safe" business; this aspect of the investor's rights is taken care of when the company is successful by the increase in the market price of the shares and a subsequent rise in the rate of interest. The new investor still gets his modest and reasonable percentage return, while the original investor who has retained his holding receives more on the capital he originally invested. The allocation of such profits seems equitable and not to be such as to cause doubts. The difficulty arises when for one reason or another the profits become greater than is "reasonable."

Suppose, for example, the raw materials can be purchased for a lower cost so that the margin between cost and sale prices is increased. There would, perhaps, be no qualms in suggesting that much of the difference should be passed on to the consumer in the shape of

decreased prices. Suppose, however, that the producing works is reorganised and that by the exercise of considerable skill and expert knowledge the cost of production is reduced. The purchaser has had nothing to do with that reorganisation; he has not suggested it, he has contributed nothing to it. Is he to receive the benefits? Suppose, finally, perhaps the most difficult case of all, the decreased costs have resulted from research work undertaken without any guarantee of a successful issue; if successful results are obtained from this " shot in the dark," is the consumer to receive the benefits for something to which he has contributed nothing, and towards the expenditure for which he has invested no capital?

Checking Speculation

THE answer depends partly on circumstances. If the business is highly competitive and rivals are reducing costs by research or by improved methods, it is obvious that our hypothetical concern must do the same and must immediately pass on to the consumer all the advantages his initiative has secured in order to retain his markets. If, however, the company has a virtual monopoly, or if, as so often happens in these days, a group of companies—mutually competitive, but in accord regarding sale prices—controls all the output, what is then to be done with the profits? Courtaulds answer that question by reducing prices all round and by increasing productive capacity by 30 per cent. Thanks to improved methods the company found the profit margin increasing so rapidly as to become unduly tempting to speculators. Fearing that this might lead to a repetition of the disastrous artificial silk flotations of a few years ago, in which some £12,000,000 of capital was totally lost by investors, Courtaulds have decided not to keep for themselves the increased profits which their wise foresight has won, but to pass them on to the consumer. There is no doubt that they are right, and in taking this step they are following the guiding principle laid down and followed by some of the most successful companies. It is wise to keep profit margins within reasonable bounds, if only to check speculation.

Reducing Production Costs

THE answer to the problem in some cases, however, is not so simple. Suppose one manufacturer out of many who are making a particular article finds a way of cheapening production. Should he immediately lower his price and so advertise the fact that he has made a discovery? Will he not by so doing drive his competitors to pursue research and to follow the paths of reorganisation, in the course of which they may quite easily discover things which place him at a positive disadvantage. For ourselves we should think twice. It might be that the reduction of price would drive competitors out of business, and in that way enhance the temporary profits; but in the long run, whatever the uninitiated may think, it is not good to drive competitors out of business. This point was stressed to us by a well-known business man a short while ago. " I welcome competition," he said, " and I should not like to hear of my competitors being in difficulties. I know them, and I know their methods. We share the work between us in a gentlemanly way and we play the game. If they disappeared, another competitor would arise—it always happens so, and things might be very much worse."

There is but one direction in which increased profits should not be handed directly over to the consumer. We refer to the staff that has made these cuts possible. It is coming to be regarded as a sign of good business management that the staff and employees shall be well paid. Where economies can achieve increased margin of profit, the employees who made those economies possible should receive their due reward, and to the limit of fair and generous treatment should take a degree of precedence of the consumer unless circumstances render it impossible. The most prosperous business is often one which is most generous to its employees.

Unemployment Among Chemists

THE improvement in trade is reflected in the statement by Professor Thorpe that not more than 3 per cent. of the members of the Institute of Chemistry are " disengaged "; from this Professor Thorpe infers that the " profession does not appear to be seriously overcrowded." It is becoming recognised in a wider range of businesses every year, that to appoint a chemist is not profitable expenditure. We are continually hearing of firms that have hesitatingly engaged chemists, finding within a few months that the chemist has saved his salary many times over. We have not yet reached the limit of the chemist in industry, and to that extent it is true that the profession is not over-crowded. That does not mean, however, that Professor Thorpe and his university colleagues should swell the ranks of chemists by enrolling students *en masse*. The chemist has a great amount of work to do, and an expensive training to undergo before he is fit to practice his profession. The experience of Germany warns us that too many " intelligentsia " will spoil the market; the " twenty-pound-a-month doctor of philosophy " of Germany is, in his own country, almost a term of derision. There are so many of them that the life of the German university graduate is not to be envied.

We agree cordially with Professor Thorpe that unrestricted entrance to the profession must be avoided, but we do not altogether agree that the best method is the insistence of a high standard of entrance examination to the universities and colleges. It is in every way excellent to prevent wasteful expense in training those not likely to be useful to the profession. But is it possible that those "likely to be useful to the profession" can be weeded out by entrance examination? We would instance an acquaintance of ours who failed to pass a university matriculation examination at the age of 21, who did not pass even that examination until 25, but who was a D.Sc. London University by the age of 33, and who is now internationally known for his researches. Is not the true answer to be sought in registration? If chemists will all join one organisation, and if, like other learned professions, they will be registered and will appoint a competent council of industrial chemists to supervise the registration they can enure that the supply is not too greatly in excess of the demand, that the quality is adequate, and that the remuneration is in every instance such as will interest men of the necessarily high mental calibre.

Centrifugal Pumps in the Chemical Industry

Features which Reduce Troubles to the Minimum

THE centrifugal or turbine pump has many applications of great value to the chemical industry. It is of small dimensions and high efficiency. If properly designed for the duty required, the maintenance and running costs are low and the life is long and trouble-free. It cannot be of too great importance, however, to emphasise the care which should be taken in selecting the particular design to meet the requirements and characteristics of the liquid to be dealt with.

The ordinary centrifugal or turbine pump designed for dealing with clean water may be used for pumping many chemicals, but, as frequently is the case, liquids have to be dealt with whose characteristics are such as to make the ordinary type of centrifugal pump—designed for dealing with water—ineffective or subject to rapid wear. Its purpose in the chemical industry may be roughly classified under three main headings :—(a) When the liquid to be dealt with has to be raised from one level to another in the factory; (b) circulating the liquid through cooling or heating systems or for mixing purposes; (c) when the liquid has to be extracted from a chamber under vacuum or where required to force the liquid through a filter, or similar apparatus.

Corrosive Action of Liquid

When the liquid is of a corrosive nature the analysis of the liquid should be examined with a view to determining the material of which the pump should be constructed. In many cases it may be found that an alloy or a metal can be chosen which is practically unaffected by the corrosive action of the chemical to be dealt with. It is frequently possible to manufacture a pump entirely in cast iron, as when dealing with caustic soda. In other cases, the pumps may be constructed of cast iron containing nickel, chromium, etc., such as nickel-iron and Nimol, the percentage of nickel being adjusted to suit the conditions under which the pump has to work. Frequently non-ferrous metals can be utilised such as gunmetal, zinc-less bronze and various similar materials; sometimes the pump may be made entirely of aluminium alloy.

When dealing with an acid such as dilute sulphuric acid the pump may be made of lead. Gwynnes Pumps Ltd.,who have had a wide experience in this class of work, have for many years manufactured a pumping unit in which the liquid can only come into contact with lead, this metal being strengthened by cast iron and steel reinforcements so that the pump is quite easily capable of withstanding relatively high internal stresses.

In recent years this same firm has developed a corrosion-resisting stoneware pump in which the liquid can only come into contact with stoneware. This particular pump design forms a general solution to the corrosion problem and can be used for many chemicals which cannot be dealt with by a pump constructed of metal. It is frequently found that a pump manufactured of some relatively cheap alloy, while costing less than a stoneware pump in the first instance, has to be replaced so frequently that the installation of a stoneware-lined pump in the first instance would make a more economical proposition.

Troubles from Abrasion

In many cases in the chemical and allied industries it is desired to pump liquids which contain abrasive material in suspension. The problem to be faced is one of rapid wear of the impeller and internal parts of the pump. Gwynnes Pumps, Ltd., have specialised for many years in the design of abrasion-resisting pumps for different purposes. The problem resolves itself into the selection of a suitable material, together with a design of pump in which the wearing parts are of very robust dimensions and the hydraulic features such that these wearing parts can be eroded away to a very great extent before the efficiency and output are sufficiently marred to make replacements necessary. The materials often adopted are specially hard iron, white iron, or, in extreme cases, manganese steel.

Should the solids be of large dimensions the passages through the pump have then to be of sufficient size to pass these solids without choking or jamming. Gwynnes Pumps, Ltd., manufacture a " Fullway " type pump which is capable of dealing with any solids which are not too large to enter the suction branch, and which is fitted with abrasion-resisting, easily-renewable wearing parts so that the pump may be depended upon for dealing with large and small abrasive solids for lengthy periods with high efficiency and long life.

It is sometimes found that the liquid carrying abrasive matter in suspension is of a corrosive nature. Here again special consideration has to be given to the material of which the pump is to be made. This material must have a combined abrasion-resisting and corrosion-resisting characteristic. It will be appreciated that this presents an extremely difficult problem on account of the corrosion accelerating the erosive effect. In some cases rubber-lined pumps have been found effective where the temperature and other conditions are not deleterious to the life of the rubber, and where the design of the pump can be made such that the adhesion of the rubber to the metal can be ensured.

Effect of Temperature

Should the temperature of the liquid to be dealt with be relatively high special precautions have to be taken. In the first place the suction lift or the vacuum which the pump will have to create must be limited so that the absolute pressure in the eye of the impeller is well above that at which the liquid would vaporise. It is practically impossible to avoid at least slight cavitation due to the flow of liquid past the inlet tips of the blades of the impeller. This has the effect of reducing the pressure locally below that of the main pressure in the eye, and, if this pressure is too near to the pressure at which the liquid will turn to vapour or steam, then the pump will cease to function or will work unsatisfactorily.

When this point is borne in mind it will be realised that where the temperature of the liquid to be dealt with is near to the possible boiling point, the pump will not raise the liquid on the suction side, and it frequently becomes necessary to place the pump at such a level that it is several feet below the level of liquid in the tank from which the pump is drawing. When it is necessary for the pump to draw from a chamber in which a vacuum has been created, similar precautions must be taken to prevent liberation of vapour in the eye.

Where the temperature of the liquid is high care must be taken in the design of the pump, and it is frequently necessary to arrange that the casing is mounted from the centre line so as to avoid mis-alignment at high temperatures. Further, the bearings and sometimes the glands may have to be water-cooled, so as to ensure successful operation. The electric motor may have to be mounted on insulating material and shielded in such a way that the heat is not transmitted to it.

Effect of Viscosity and Density

The value of the viscosity of the liquid may have a profound effect on the hydraulic performance of the pump. Should this viscosity be relatively high the output and head generated for a given pump would be considerably less on a viscous liquid than when pumping water, and the power absorbed considerably higher. It is therefore necessary for the pump manufacturer to have full particulars of the viscosity of the liquid so that he may select a pump whose hydraulic characteristics are suitable for the conditions involved.

The specific gravity of the liquid must also be taken into consideration. For liquids of the same viscosity, but with different specific gravities, the horse-power increases approximately in proportion to the specific gravity, and for a given speed and quantity the pressure generated in lb. per sq. in. also increases in this ratio. Here, again, the pump manufacturer must be made aware of the conditions involved so that when deciding on the size of prime mover he can determine what is the maximum power which may be absorbed. Incidentally this also applies to the head. In most designs of centrifugal pumps, as the head against which the pump

is discharging is reduced, so the quantity increases and the horse-power absorbed rises. It therefore becomes necessary to inform the pump manufacturer of the highest and lowest heads against which the pump may be required to discharge.

It is frequently necessary to pump liquids which are highly volatile and inflammable. Careful precautions must be taken in the design to render the plant immune from the danger of fire. Another danger which must be guarded against is leakage from the glands of liquid which may quickly evaporate and form an explosive gaseous mixture. Another danger which must be guarded against is the generation of electrostatic discharges. Many volatile and inflammable liquids are relatively high electrical insulators. It will be realised that static discharges may be generated due to the impeller and other rotating parts of the pump revolving in an insulating medium, possibly in the presence of dissimilar metals.

Danger from Static Discharges

In the pumps manufactured by Gwynnes Pumps, Ltd., brushes are fitted which definitely connect the rotating parts electrically to the casing. In addition, where belt drive is utilised suitable precautions are taken by the provision of brushes to earth any possible static discharges, the whole plant thus being efficiently connected to earth.

The type of prime mover must be considered carefully. If an electric motor, it is frequently found advisable to arrange for the pump itself to be installed in one room and the motor in another room with a thin partition wall between, the drive being by means of a shaft passing through a stuffing box and gland in the wall. The starter for the motor, of course, would be accommodated in the motor room. By this means any sparking which may occur in the motor or the starter cannot ignite any inflammable vapour which may have leaked from the pump gland. As an alternative the motor driving the pump may be of the flameproof type as used in fiery mines, with the starter of similar construction.

The design of the pump for any particular conditions, as outlined above, must be considered carefully. It will be realised that frequently combinations of characteristics of the liquids are experienced and each particular factor must be given careful consideration. In general it is not desirable that the pump should have any internal bearings or bushes which can come in contact with the liquid owing to the possibility of contamination of liquid by lubricant, or chemical action making the lubricant ineffective.

Mechanical Features

The simplest type of construction is usually the most efficient and, for this reason, single inlet pumps are most frequently installed. Generally speaking, the pumps manufactured by Gwynnes Pumps, Ltd., have two outside bearings carried in pedestals. These may be of the ball or roller type, or, in some cases, of the oil ring lubricated type. The two bearings are spaced some little distance apart so that the impeller, which is overhung, is rigidly supported. For high temperatures these pedestal bearings may be water-cooled, the whole being mounted on a rigid cast-iron bedplate to preserve alignment. The stuffing box must be deep so as to hold an ample amount of packing, which must be of material specially selected to withstand any corrosive action involved by the type of liquid to be dealt with.

Frequently drip trays are provided from which a pipe may be led away to collect any liquid which may have leaked through the gland. The hydraulic design of the impeller is usually such that the gland is not subjected to high pressures. In circumstances where the liquid being dealt with is of great value some special form of gland may be used, such as the "Packless" gland which comprises a carbon ring and bellows.

When dealing with liquid foodstuffs, such as soups, milk, etc., Gwynnes Pumps, Ltd., have specially designed centrifugal pumps which can very rapidly be dismantled, and in which the internal parts are given a smooth finish.

Avoiding Centrifugal Breakdowns

The Need for Periodical Inspection of the Basket

THE maintenance cost of centrifugals is considerably reduced by installing a machine of reputable make, even if the initial cost is rather more than what appears to be an exactly similar machine of a competitive make. Firms of repute, who have specialised in these machines for, say, over half a century, are fully conversant with past failures, and their designs have been improved from time to time to eliminate all possibility of breakdown.

Centrifugals for chemicals are often treating materials of a corrosive nature, or working in an atmosphere which causes corrosion. All constructional steelwork should therefore be periodically scraped and painted with a good acid-resisting paint or coating, and bright steelwork covered with rust preventative. In some instances it is a paying proposition to have the exterior of the monitor case lined with sheet lead. In all cases, the monitor case should be lead-lined inside, if the slightest trace of acid is in the liquor. The operator should be given instructions to lubricate the machine very frequently; too much lubrication is better than too little. Lubricators often get broken off or corrode away, and the matter is not reported; in such circumstances, lubrication is entirely stopped, and a breakdown soon occurs. Grease nipple lubricators are to be recommended, as these do not project much, and the grease is forced by means of a hand pump to the vital part. No doubt lack of lubrication is the cause of many breakdowns and increased maintenance cost.

The principal maintenance item of a centrifugal is the upkeep of the basket, as the substance or material under treatment is in direct contact with the basket. Where accidents have happened to centrifugals used for acid salts, investigations have generally proved the accident to be due to the basket having corroded beyond safe working limits. Black steel baskets, according to Thomas Broadbent and Sons, Ltd., should be inspected every two weeks after the first two months' service; copper baskets every four weeks after the first four months' service; Monel metal or rustless steel baskets, every eight weeks after the first eight months' service. In making the inspection the principal points to observe are:—(1) Does the shell show signs of bulging out? (2) Has the thickness of the shell been reduced? (3) Have the perforations increased in diameter? Should any of these signs of deterioration be noticed, the basket should receive immediate attention. Repairs should, if possible, be carried out by the original makers, but, if done locally, great care must be taken to keep the balance of the basket correct. It is of the utmost importance after all repairs, to test the basket in a balancing machine, and re-balance, if necessary, as a basket which is out of balance, when running at full speed, may wreck the whole machine.

Corrosion can be slightly retarded and the life of the basket prolonged by washing the basket thoroughly after each day's work, and drying off by running the machine empty for a few minutes. In the case of black steel baskets, a copper or Monel metal sheet lining, suitably perforated, will last several months and considerably increase the working life of the basket. The gauze types of linings deteriorate too rapidly. Cocoa-nut matting is occasionally used as a lining; it is cheap, but requires frequent renewal.

PAPERS published by the staff of the National Physical Laboratory during February, 1934, include:—"Heat Transmission through Circular, Square and Rectangular Pipes," by A. Bailey and W. F. Cope (Aeronautical Research Report No. 1560), and "The Structure of Oxide Films on Nickel," by G. D. Preston ("Philosophical Magazine," *17*, 446).

Good Grinding is a Matter of Mill Maintenance

By W. A. STAPLETON,

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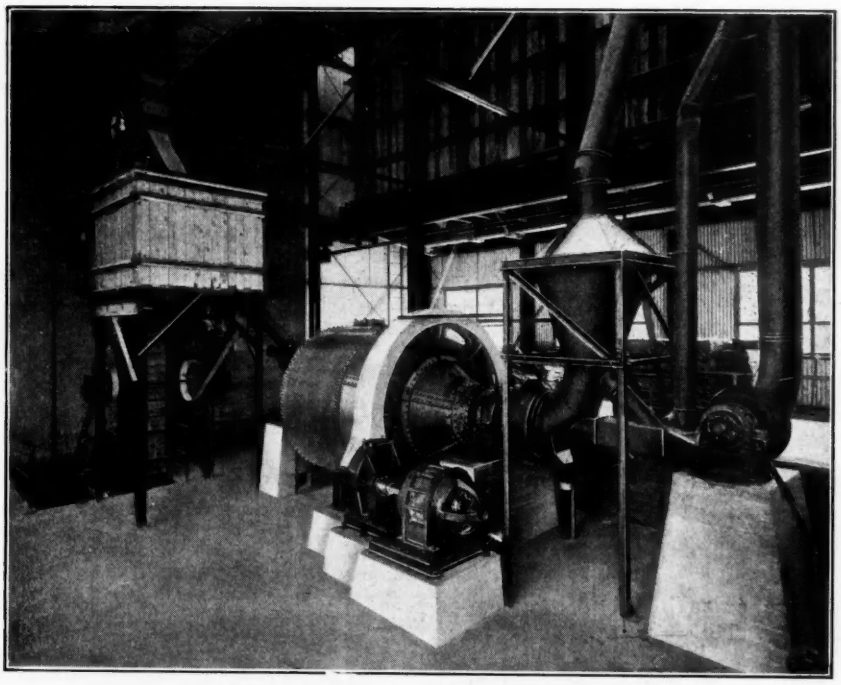
MAINTENANCE costs in regard to grinding machinery should be taken very seriously. Not only should the cost of replacements be taken into account; the time taken up in making the replacement is often a considerable item, because there are quite a number of machines on the market that are not correctly designed to give ready access in the task of renewing the wearing parts.

Due to lack of frequent inspection it will be found on many machines that fineness drops off and capacity is retarded solely due to the fact that these machines are not fitted with a classifier. In such cases the operator cannot tell what is taking place and he begrudges making an inspection of an inaccessible part. In consequence, the product is shipped to a customer, who will send in a complaint, and it is not until this complaint is received that attention is drawn to the condition of the mill. In some cases large yearly contracts have been lost through lack of attention being given to the grinding plant.

Maintenance costs can be lowered by choosing the most suitable machine for the actual duty it has to perform and the author of this article advises any reader to view grinding from the aspects of (a) " low speed," (b) " medium speed," and (c) " high speed " grinding. The materials to be ground may be (a) hard and abrasive, (b) medium hardness and friable, or (c) soft and non-abrasive. Silicious or very hard materials should be ground at " low speed "; rocks of medium hardness, carrying up to 10 per cent. silica, at " medium speed," and fibrous materials, soft crystallines and chemical compounds at " high speed."

Maintenance costs per ton of material treated can, in many cases, be reduced by studying the arrangement of plant. It is possible to eliminate an elevator with its attendant faults and replacement by installing a grinding mill fitted with efficient air separation in one combined unit. The all-in replacement costs are bound to be less. Elevators are sometimes used to take the discharge from the mill and feed to a mechanical separator returning oversize down chutes or screw conveyor back to the mill feed; this arrangement increases wear and tear all round, especially if the material is silica. It is not possible to get a dustless system by this method, and the dust from the plant wears near-by bearings, belts and other parts. All of these factors should be taken into account from a maintenance standpoint.

Very often one finds a crude attempt being made to draw off dust from various points on some grinding systems, and in every case it will be found that these " extras " could have been obviated at the outset. The question of capital cost of any grinding plant should include these extras, such as elevators, dust-collecting equipment, etc., for in nearly every case it will be found that if a closed air circuit grinding plant had been installed it would certainly have been more economical.



A Typical Grinding Installation Equipped with Dust Collecting Equipment.

With a view to reducing maintenance costs it is advisable to study the class of material selected for any given part of a grinding machine, in addition to selecting the correct type of machine. Inquiries should be placed with some reputable firm who actually makes the three types of machines mentioned, because such a firm have had actual experience, usually over many years, and can give a guaranteed figure for maintenance costs per ton of material milled.

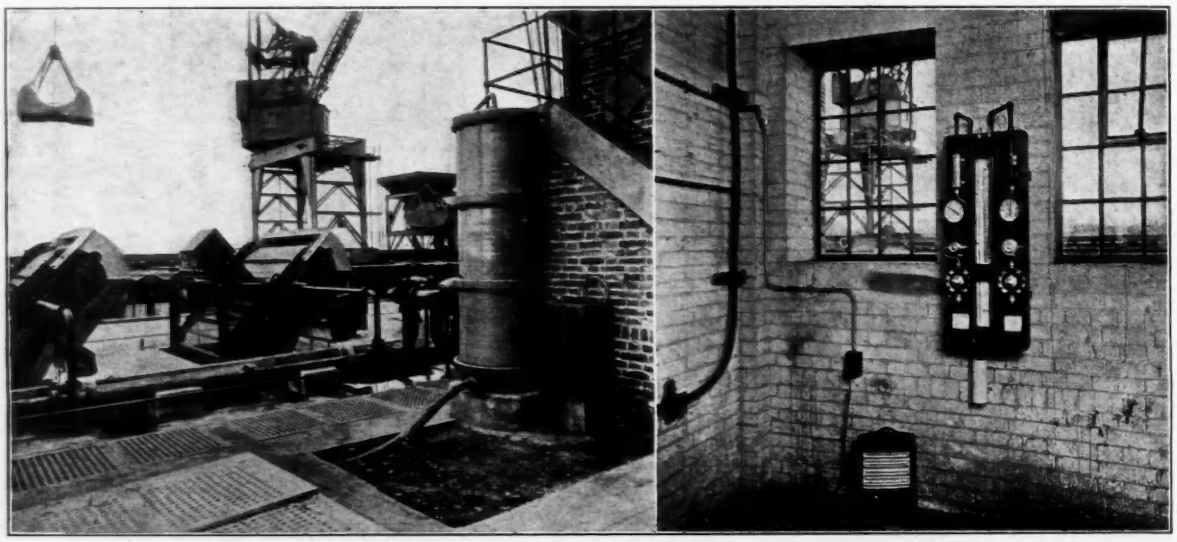
From an operating point of view it is essential to have a regular feed to any type of mill. For efficient running to get the greatest life out of the wearing parts, size of feed, moisture in feed, and speed of machine to suit feed and character of material, should be carefully watched, and frequent inspection of wearing parts should be made. In many instances maintenance costs can be reduced by using the correct type of preliminary crusher before feeding to grinder. High speed swing hammer mills can often be seen treating hard abrasive materials, and a complete set of hammers are worn out after grinding 40 tons, for although the hammers are correct it is incorrect to use a high speed machine. Here, gyratory and jaw crushers would show a large saving.

Non-Fouling Condenser Plant

Means for Preventing the Growth of Organic Matter

ONE of the most troublesome matters in connection with the operation of condensing steam turbines at power stations, chemical works, and industrial establishments generally, is the gradual formation of organic growths, particularly on the outside of the condenser tubes. This reduces the heat conductivity and lowers the maximum vacuum normally obtainable, thereby reducing the efficiency of the turbine and causing an increase in steam, and therefore coal, consumption. Consequently the maintenance costs of power plant are considerably increased, since at intervals it is necessary to clean the condenser tubes by hand, which is a laborious procedure and one which also means a large amount of equipment being put out of action at frequent intervals.

The modern scientific method of dealing with this problem is to sterilise the cooling water by means of chlorine gas, for which purpose the Paterson Engineering Co., Ltd., supply the necessary equipment. This "Chloronome" apparatus is now widely in use for the treatment of towns water, sewage effluent, and swimming bath water, and over 2,000,000,000 gallons of water per day are being treated. The latest principles of the process are well represented by the installation at the new Battersea Power Station, London, just recently completed. Here the cooling water, taken from the River Thames, passes through screens and enters a tunnel 12 ft. diameter and 950 ft. long, leading to a pump suction chamber. From the latter the water is discharged to the condensers by four horizontal centrifugal pumps, each of which moves 2,000,000 gallons of water per hour against a head of 30 feet. The chlorine gas, in the form of a dilute solution, enters the water during its passage through this 12 ft. diameter tunnel, by means of a system of narrow-bore ebonite distribution piping.



Left: Outside the Paterson "Chloronome" House at the Battersea Power Station, showing Chlorine Saturation Water Tank which discharges a solution of chlorine to the cooling water. *Right:* Automatic Control Panel for Chlorine Gas.

The Chloronome Apparatus

The "Chloronome" apparatus consists essentially of a panel with control valve, gauges, metering device, and other appartus coupled up to cylinders or drums of liquid chlorine, the rate at which the latter is used being adjusted with great accuracy by one valve. The measured gas first passes into a water absorption tower, where it forms the dilute solution, which then discharges to the bulk of the water, as already indicated, so as to give an immediate and rapid mixing, otherwise not easy to obtain with such large volumes. From 0.50 to 0.75 parts of chlorine per 1,000,000 parts of water are required.

At Battersea Power Station the liquid chlorine is contained in 15 cwt. drums, which are coupled to a pipe circuit with diaphragm valves supplying the "Chloronome" apparatus. The latter has a maximum capacity of 50 lb. of chlorine per hour; the panel is of cast aluminium and is provided with a chlorine gas filter, stop valve, regulating valve, and pressure gauges, the pressure of the chlorine from the drum being reduced in two stages by means of a precision reducing valve so that it gives a constant pressure at the flow regulating valve irrespective of the conditions in the drum. The rate of the gas flow is shown on a 12 in. silvered scale, while the measured volume of gas is then absorbed in water in a vertical cylindrical stoneware tower, from which the solution is discharged by way of the ebonite pipes.

This efficient method of sterilisation is also available, it may be stated, for preventing the growth of weeds in cooling towers, and the growth of mussels, limpets, and other shellfish in circulating pipes when sea-water or other brackish water is used for cooling purposes.

Chemical Matters in Parliament

Imported Molasses (Distillation)

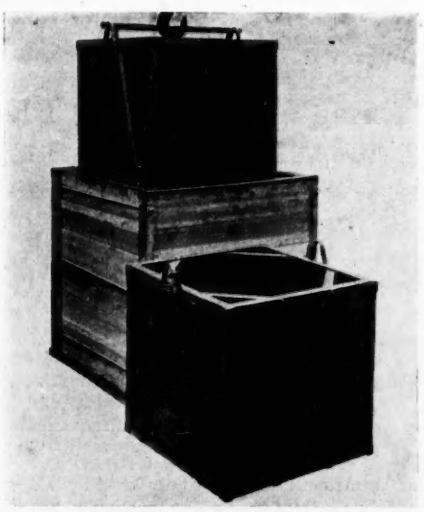
IN the House of Commons on March 6, Colonel Ropner (York, West Riding) asked the Chancellor of the Exchequer whether he was aware that molasses was being imported into this country for the purpose of distilling alcohol from it, and whether Excise Duty was charged on such alcohol and at what rate; whether he was satisfied that the steps being taken in this direction were adequate to protect the revenue in view of the fact that this alcohol was being mixed with motor spirit and used as a substitute therefor.

In reply, Mr. Hore-Belisha said he was aware that alcohol was and for many years had been distilled in this country from imported molasses; such alcohol when made into power methylated spirits and when used for industrial purposes generally was expressly exempted by statute from the Excise Duty on spirits; the matter was kept under observation, but no action was called for at present.

Monel Metal in the Chemical Industry

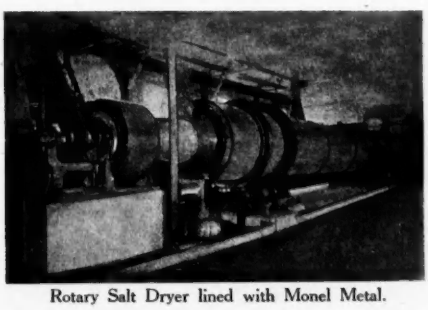
Reduction of Corrosion Means Lower Maintenance Costs

THE technically-controlled nickel-copper alloy which is known by the registered trade name of Monel metal has a wide variety of uses in the field of chemical engineering. Probably its best known property is its inherent ability to resist corrosion. Since copper and nickel are mutually soluble in the solid state the structure of the alloy resembles that of a pure metal. This is important from the standpoint of corrosion, and therefore of plant maintenance, since there can be, therefore, no selective corrosion as in many steels and certain brasses which exhibit two or more constituents. The corrosion resistance of Monel metal, moreover, is independent of the surface finish.



Monel Metal Perforated Baskets and Tank for boiling locust beans with 10 per cent. sulphuric acid in the manufacture of cattle food. These baskets are fitted with heating coils of solid drawn Monel metal tubing

The reactions of Monel metal to alkalies and acids are questions which affect most chemical engineers. According to the technical service department of Henry Wiggin and Co., Ltd., the resistance of the metal to all alkalies is practically complete, but there are one or two acids in contact with which the metal may not be used. It is attacked by nitric acid, sulphurous acid, and, under certain conditions,



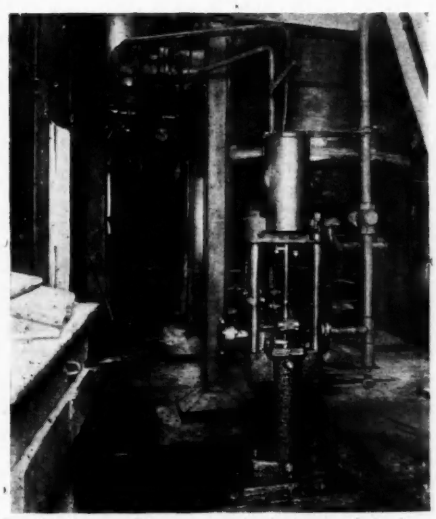
Rotary Salt Dryer lined with Monel Metal.

by chromic acid. With regard to almost all other acid solutions Monel metal can show a very useful performance.

Industrial corrosion problems frequently involve many variables and unless laboratory tests take cognizance of those obtaining in any particular job, they require to be carefully interpreted. Bowls of Monel metal in centrifugals are put to such diverse services as clarifying lemon juice or separating sulphuric acid from lubricating oil; the metal also has important applications in pickling and dyeing plant.

It is not resistance to corrosion alone which has given Monel metal its prominent place in so many industrial fields. It has qualities of strength, durability and toughness which greatly enhance its value to the chemical engineer. Its strength, even in the annealed condition, is greater than that of mild steel; it is therefore much superior to that of copper and brass. Under conditions of heat up to 400°-450° C., the metal retains a high proportion of its initial tensile strength. In contact with superheated steam it shows a far better strength performance than other materials such as steel, bronze or gunmetal, and it is very widely used, therefore, for valve components and spindles at superheat temperatures, standing up to these conditions better than the alloys mentioned. Monel metal, moreover, may be subjected to severe cold working yet it will retain its characteristic toughness. This combination of strength and toughness with corrosion-resisting powers is a valuable quality. Other materials are resistant to corrosion, but none have such a wide range of pertinent physical properties as Monel metal.

The use of lead often provides a reliable resistant covering where sulphuric acid is handled, but its softness presents many difficulties from the practical point of view. On the



Cresylate Pump, with pump rod, bucket liner and gland nuts made from Monel Metal. (Glasgow Corporation Chemical Works.)

other hand, the hard, durable, yet easily-worked Monel metal is capable of a useful resistance to this acid up to a concentration of 80 per cent. at room temperatures, and in actual practice resists sulphuric acid over a wide range of working conditions.

The workability of Monel metal is a strong point in its favour. It is, for example, more easily cast than certain of the nickel-chromium alloys which are sometimes used in chemical engineering. It may be readily welded, either by the oxy-acetylene or eiectrical methods; and properly made welds are as immune to attack as the parent metal. The alloy is not susceptible to weld decay, and therefore requires no special heat-treatment as is the case with many nickel-chromium steels. In its various forms it lends itself to forging, casting, machining, soft or silver soldering and brazing. Tubing may be coiled, threaded, welded or expanded. Owing to this ease of fabrication Monel metal has marked advantages over silicon cast irons. These cast irons possess valuable acid-resisting properties, but since they are impossible to machine, difficult to grind and very brittle it is often profitable to explore the possibilities of Monel metal in some of the applications for which silicon cast iron is sometimes used. Monel metal not only possesses superior toughness, but can

usefully resist many of the industrial acid solutions for which silicon cast iron is employed.

Examples of enhanced durability obtained by substituting Monel metal for some of the older commercial materials may be cited. For instance, Monel metal centrifugal baskets are used for the drying of ammonium sulphate in the leading gas-works and coke-oven plants all over the world. These baskets have proved themselves satisfactory for drying sulphate of widely varying acid content, but in particular they have an outstanding advantage where, in addition to its function as a centrifuge, neutralisation of the last traces of acid is effected in the basket by spraying in ammonia liquor during the whizzing operation. These conditions of service are particularly severe, since the metal has to withstand not only the sulphuric acid carried by the crystals from the saturator but also the action of the added ammonia. Nevertheless, Monel metal baskets give a life of six, and in many cases even ten, times that of the copper or bronze baskets previously employed.

An American sugar company recently installed Monel metal mesh in some of their plant, replacing an older type of filter cloth. A critical and accurate survey was made of the savings due to the introduction of this metal, and it was found that a saving of over 67,000 dollars per annum was the result of the change. To take another example, economies have been effected in coal screening apparatus by the introduction of Monel metal "wedge wire" screens. In this case the superiority of Monel metal is due to its abrasion-resisting qualities which are of a high order. After over two years' service the Monel metal screens have been found to be as good as new, but steel or bronze screens under the same service conditions were completely worn out in a few months.

Monel metal comes very near to offering the ideal solution to the question of efficient pump rods and valves in processes involving conditions analogous to those in chemical plant. Since it is practically immune from attack by anhydrous ammonia, valve spindles and pump rods in service in refrigerating plants are made from this material and are found highly satisfactory in ammonia circuits and compressors. The pump rods have a high fatigue value due to the high modulus of the alloy. The rods develop a glassy polish after a short period of service and friction is reduced to a minimum; moreover, there can be no flakes of rust to find their way into the stuffing boxes and damage the packing. Owing to the excellent abrasion-resistance of Monel metal, gritty solutions can be usefully handled by pumps equipped with Monel metal rods and valves. Pumps with Monel metal rods and valves are daily in use which handle hot tar, cresylates, gelatine, inks, soap stock, sea water, glycerine, milk, oils and tomato products, with a marked reduction in maintenance expenditure.

The benefits of Monel metal are also widely appreciated in the salt industry, and advantage is taken of the alloy's resistance to brine and wet salt in all sorts of equipment from evaporators and conveyors to chutes and rotary driers. Corrosion rates are found to be negligible and there is a marked absence of local action. When used in evaporator parts the metal is also valuable from the point of view that it is highly resistant to the erosive action of impure steam.

Tar Still Troubles

Need for Protection against Temperature Changes

THE Leeds and Bradford Boiler Co., Ltd., have long been known as the makers of a high-grade range of tar stills and tar plant generally, and their products, by reason of the exclusive methods by which they are made, are claimed to give exceptionally satisfactory service. Whilst most plants are well cared for, there are small points which make a big difference sometimes overlooked and they have been able to help many of their friends in the trade by advice on the proper protection and care which plant demands. For instance, it is most essential that the firebricks around the bottom of a still should be carried up sufficiently far inside to cover the inner circular seam of rivets. This protects a vital part of the still from the fierceness of the fire. It is also very important to have all the sides and top of the still properly covered with insulating bricks or other suitable material.

When cases of excessive corrosion or erosion have been put to them, the Leeds and Bradford Boiler Co., Ltd., have often been able to identify the cause as due to imperfect protection. They have seen cases where the manhole, or one or more of the blocks, have not been insulated. This forms a cold spot where a great deal of condensation takes place the most common result of which is "grooving." Under the best conditions there is bound to be a greater cooling effect near the blocks, but by careful design this is not seriously detrimental when the cooling is reasonable. Correct block design and a shallow top are very important in this connection. Perhaps the worst cases have occurred where the tar inlet block is in the side of the still and has not been sufficiently covered; it is most important to attend to this point as well as to project the inlet block inside the still. Thickening the side plate immediately below it is also of considerable assistance.

Stills, like chains, are as weak as their weakest link, and care on the various points mentioned above will be found to repay the small amount of time and trouble expended on them.

Mixing and Kneading Plant

Two Kinds of Attention Needed

WHEN dealing with the question of the maintenance of mixing plant at chemical works, the subject should be considered in two directions. First, there is the maintenance of the interior of the vessels, which is in contact with the chemicals and, therefore, susceptible to corrosion, abrasion, and other troubles; secondly, there is the maintenance of exterior mechanical parts.

In regard to the vessels, it is of primary importance to note what type of wear is taking place. This may either be due to abrasion or to chemical action or to a combination of these two. If it is discovered that serious wear has taken place and a major repair is necessary, special consideration should be given to the materials of which the vessel is made. To-day the variety of materials which can be used is very extensive, and it has been found that extremely hard metals, soft metals, rubber, stone, glass and many other substances can be used effectively for lining all types of mixing machines. Naturally the most difficult conditions are met when a combination of chemical action and abrasion is present; to overcome this, machines have been lined with such a substance as rubber and provided with renewable hard metal edgings which take the brunt of the wear.

In dealing with the maintenance of the mechanical side of mixing machines, it should be remembered that considerable wear is often caused through chemical action owing to the spilling or dripping of foreign materials upon gears, bearings, pipes, etc. So far as gears are concerned the fitting of efficient gear guards is always an economy, as this not only makes the gears safe for the operator, but also prevents foreign matter working into them. In many cases too little attention is paid to the design of gear guards on machines of any type, and where gears can be completely encased and run in oil immense maintenance savings are effected.

It is also surprising that insufficient attention is frequently given to the condition of the bearings, for in most cases excessive wear on the bearings of mixing machines is directly due to the lack of lubrication. Sometimes this may be attributed to poor design, the lubrication points being inaccessible, but nevertheless the matter of lubrication of all bearings should be very carefully watched, and it is also important to see that suitable oil or grease is used. When dealing with machines which are working in a damp or acid atmosphere excessive wear will be found in all cases of laminated driving or lifting chains unless they are lubricated with a thin oil and are running in an oil bath. The use of ordinary link chain for lifting purposes, where these have to be exposed, is recommended.

Most up-to-date works arrange for a systematic greasing programme to be carried out weekly, or at some other definite period according to the classes of mixing machines involved, and there is no doubt that this contributes to keeping maintenance costs within reasonable limits.

The British Association of Chemists

Annual Dinner of the London Section

THE annual dinner and dance of the London Section of the British Association of Chemists was held at the Palace Hotel, London, on March 10, when there was an attendance of nearly 100 members, ladies and guests. Mr J. C. Mellersh, chairman of the London Section, presided, and among those present were Professor E. C. C. Baly, president of the Association, Dr. H. Levinstein, Professor G. T. Morgan, president of the Chemical Society, Mr. C. S. Garland, Mr. S. Reginald Price, past president and chairman of council, Mr. J. Davidson Pratt, general manager of the Association of British Chemical Manufacturers, Miss W. Wright, hon. secretary of the London Section, Mr. C. B. Woodley, general secretary, Professor A. C. Green, vice-president, and Mr. J. B. P. Harrison, vice-president.

Professor E. C. C. BALY proposed the toast of "Chemistry" and said that the Association had spent nearly £10,000 in helping those who had been unfortunate enough during the recent slump to lose their jobs. The council had had under consideration various methods whereby it would be possible to advance the interests of the Association and amongst them was the scheme of inviting the head of every chemistry teaching department of any standing in the country to nominate one or two ladies or gentlemen who would accept the office of hon. student member of the Association to act as liaison officers and spread the good work among fellow chemists. Letters had been written to 28 heads of departments, of whom 12 had submitted nominations. Certain colleges made it a rule never to allow any propaganda work and no further action could be taken.

The Unemployment Levy

In some cases objection had been taken to advising students to join a trade union. In the early days there was a compulsory addition to the subscription to provide for unemployment benefit but it was found to be illegal for a voluntary body to do that. The unemployment benefit, however, was considered so important that the only thing to do was to get the Association registered as a trade union. It was found that levies could also be made for political and strike purposes, and steps were therefore taken to get those clauses expunged, leaving only the compulsory levy for unemployment benefit.

The Association did not set itself up as a rival to the Institute of Chemistry as a qualified body for chemists. The Institute of Chemistry was in the same position to the chemical profession as the British Medical Association was to the medical profession, but the British Association of Chemists could do things which the Institute of Chemistry, as a voluntary body, could not do. In his view the future success of the Association depended upon co-operation with the Institute of Chemistry. Students were being asked to join through the medium of the hon. student members, but they might well plead that their professor was not a member. To meet that objection the council had introduced a new class of membership, to be known as Fellows, to get the type of man to whom he had referred to to join. In time, he believed the need for such a distinction would disappear.

Subscriptions Too High

Dr. HERBERT LEVINSTEIN, responding, said industrial research and the dissemination of knowledge concerning research were bound up together and if we were to compete with the other nations of the world we must subsidise industrial research and make the results known to the nation. A great deal was being done on these lines in Germany and Japan, and it was essential that research workers should be of a sufficiently high calibre. Industrial research involved the application of fundamental knowledge which for the most part must be looked for from the university laboratories, but it was perfectly clear that the work done there and also in the industrial laboratories must be made available in order that further work might progress. In the same way information must be available concerning work being done in other countries and in order to be successful that implied two things. In the first place, the publication must be in our own language and, in the second place, the abstracts must be sufficiently full so that they could be understood easily and without trouble. Such abstracts must be published at a price within the means of the industrial chemist.

Subscriptions to such bodies as the Chemical Society, the Society of Chemical Industry and the other societies representing special branches were, in the aggregate, too high. Under present conditions, the greater proportion of the subscriptions to the Chemical Society and the Society of Chemical Industry went in the form of publications for the members. The net amount spent by the Society of Chemical Industry in this way was about £11,000 a year whilst the Chemical Society spent about £5,500 in a similar way, a total of between £15,000 and £16,000. The burden of finding that sum was too heavy for the chemists of this country. He hoped it would be possible to induce the Government to assist in the publication of this essential chemical knowledge on a pound-for-pound basis which had found acceptance in other quarters already. That would be a more easy and useful thing to achieve than to endeavour to bring about a fusion between the Chemical Society and the other bodies.

Overlapping Membership

Professor G. T. MORGAN, who proposed the toast of "The Guests," referred to the consolidation of the chemical profession and said he felt strongly that the Chemical Society and the Society of Chemical Industry merited more support from the chemical profession in general than they now received. The membership of these two societies was only 9,000 and nearly £2 a head was being spent in the publication of chemical literature, a burden which was rapidly becoming overwhelming. No less than 54 per cent. of the members of the British Association of Chemists were also members of the Institute of Chemistry. Why should those members pay two subscriptions for work required in the recognition of the professional status of chemists? The subscription to the Chemical Society was £3 and to the Society of Chemical Industry £2 10s., but on these subscriptions the societies could not make ends meet. That was due to lack of membership and if they could get an all-embracing organisation, with a membership, not of 5,000 or 4,000, but of 15,000, then he believed one subscription of £5 would suffice. The three senior bodies had a total membership of 15,000, but there was overlapping amounting to some 3,000 members so that the individuals represented amounted to about 11,000. If allowance was made for the overlapping membership of the other bodies, including the 1,600 members of the British Association of Chemists, there would still be something like 11,000 possible members for one large organisation.

Industry would never help chemists as long as they were members of 14 to 16 different associations. The business man concerned with mergers and large business combinations could not understand why he was asked for 14 to 16 different subscriptions to chemical organisations. The profession had been running along on disunited lines for over 60 years, but sooner or later it would be necessary to have some closer measure of federation. The physicists had shown an example because only recently the Physical Society and the Optical Society had joined together and the Institute of Physics was also acting as a sort of parent body for five other physical societies.

Mr. J. DAVIDSON PRATT, in a short response, said that in spite of considerable efforts during the past 18 months there had not been the progress there should have been in regard to the co-operation which was being sought. It would be necessary to do a great deal of educational work to make everyone realise the real objects for which co-operation stood. The fundamental object was to make the profession of chemistry take the place it should occupy in this country. The desire was to put the profession in the position of the medical profession so that the mere mention of the fact that a man was a chemist would at once give great social prestige and standing.

Notes and Reports from the Societies

Society of Chemical Industry

London Section : Rubber Accelerators

DEALING with the chemistry of rubber accelerators at a meeting of the London Section of the Society of Chemical Industry, on March 5, Dr. W. J. S. Naunton, Mr. W. Baird and Mr. H. M. Bunbury gave a brief account of some of the developments that have taken place since the original discovery of accelerators which was almost simultaneous in America and Germany. Dr. Naunton pointed out that in America rubber accelerators were discovered during the course of some work directed to the discovery of some ingredient which could be added to very cheap wild rubbers in order to enable articles to be made of a quality which would compare with those made of pure para rubber. Simultaneously, biochemists working in Germany on the problem of synthetic rubber discovered accelerators, but there was no doubt that the United States was using accelerators several years before they were used in Europe.

Accelerators were extraordinarily poisonous substances and the rubber chemist soon turned attention to the problem of converting the bases of accelerators into more or less non-poisonous substances. It was then found that "scorching" took place, and there followed some fundamental work both in America and Italy on the whole problem of accelerator action. For a time, however, it was still found that scorching took place, until finally the substance which was known shortly as "D.P.G." was discovered and in a very short time the consumption which at first was only a few pounds per month increased to several thousand tons per annum. A substance previously discovered and known shortly as "M.B.T." however, also had considerable advantages as an accelerator, and a special point about it was that it gradually improved the resistance of rubber to abrasion and at the same time it gave excellent ageing properties. Nevertheless, there was still a certain amount of scorching and it was realised that what was wanted was an accelerator with the properties of "M.B.T." as regards resistance to abrasion and also the same ageing properties but without scorching. Whilst considerable improvement in these two respects were subsequently achieved by mechanical means it was nevertheless much more satisfactory to obtain the necessary properties through the medium of the accelerators themselves and that became a real problem for the rubber chemist.

A great deal of work, said Dr. Naunton, had been done on modifying the accelerator to the end mentioned and in connection with tyre manufacture it was pointed out that considerable progress had been made by converting "M.B.T." into one of its salts. One of the outstanding examples was the manganese salt, but for certain reasons he did not recommend it. The cadmium salt was fairly good, antimony salt was reasonably good, but lead salt was not particularly good. In this way it had been possible to obtain an "M.B.T." accelerator without scorching. In the same way the monosulphide, although practically useless in itself, became an excellent accelerator when used in combination with another accelerator, and used in combination with "D.P.G." was an accelerator which gave all the desirable qualities, especially for such purposes as solid rubber tyres and giant pneumatics, where the question of resiliency was very important.

Nottingham Section : Tariffs

TARIFFS were the subject of a paper which Mr. J. Davidson Pratt read before the Nottingham Section of the Society of Chemical Industry, on March 8. Without attempting to discuss the rival merits of tariffs and free trade, the author indicated the idealism of free trade theories and pointed out that a country's tariff policy is generally merely a question of expediency, that is whether tariffs or free trade pay it best. This country's prosperity in the latter half of the nineteenth century was really due not to free trade, but to the fact that it was the greatest manufacturer in the world, and was producing goods that nobody else made. Had we continued our free trade policy, we would have been ruined. Tariffs, on the other hand, tend to breed inefficiency and promote political jobbery.

After describing the difference between revenue and protective tariffs, and the various types of duty such as specific and ad valorem, Mr. Pratt gave a historical survey of the country's post-war tariff policy as it affected the chemical industry. The great advantages that have accrued not only to the fine chemical and dyestuffs industries, but also to the users of these products as a result of the Key Industry Duty under the Safeguarding of Industries Act, 1921, and the Dyestuffs (Import Regulation) Act, 1920, were clearly set forth. The value of a strong and progressive organic chemical industry is now well recognised as of vital importance to the national prosperity and safety, and the experience which it affords to chemical technologists of all kinds is of the greatest value in the development of industries outside the purely chemical field. The Hydrocarbon Oil or Petrol Duty, which, in effect, has given a bonus of 8d. per gallon to home produced motor fuel, has stimulated the production of benzol from coke-ovens and gasworks, but has adversely affected those sections of the chemical industry which use benzol and toluol as essential raw materials. It has borne heavily on the dyemakers who have to meet the foreign price with their dyes and intermediates.

The main provisions of the Import Duties Act were explained by Mr. Pratt, and the procedure and arguments necessary to carry an application for free listing or for an additional duty to a successful conclusion were set forth in a way which should assist any industry which has cases under consideration. The chemical industry has been successful in securing free entry for practically all its important raw materials which are not commercially available within the Empire, and has been able to protect itself against foreign competition by additional duties.

As to the final question of whether our tariff system has benefited the country, the author had a number of pertinent observations to make. On the short view, he said, tariffs have undoubtedly been of great value, but these benefits will be maintained only if industries keep abreast of their foreign competitors in efficiency. Increased efficiency will come only from a greater appreciation and application of science and scientific method in all aspects of industry.

South Wales Section : Drought Menace to Boilers

A WARNING to users of boilers of the dangers arising from the water supplies available during the present time of drought, was given by Mr. George S. Irving, A.M.I.Chem.E., when reading a paper on "Boiler Water Treatment," at a joint meeting of the South Wales Section of the Society of Chemical Industry and the Institute of Chemistry, at Cardiff on March 8.

During times of drought, said Mr. Irving, feed waters are liable to increase greatly in hardness, and "foaming" may occur owing to the greatly increased amount of suspended matter in the boilers. It is surprising that the authorities in factories where live steam is used in process work do not fit large external steam separators. No one would dream to-day of using electrical machinery not provided with fuses as a safety precaution; similarly, where live steam is used in process work, adequate precautions should be taken. Mr. Irving also emphasised the importance of obtaining steam as free as possible from other substances, by the correct conditioning of boiler feed water, and added that the quality of the steam, as distinct from the quantity, was not given sufficient attention. It was thought sufficient to supply boilers with water which had been "softened," but the "conditioning" of boiler feed water only began with the water entering the boiler. This, said Mr. Irvine, showed that the removal of hardness was not the beginning and of its treatment. It had been found that the use of a colloid, blended with other suitable ingredients, gave a rational treatment which proved remarkably effective.

Speaking of the variety of problems associated with boiler feed water, Mr. Irving pointed out that those awaiting solution included (1) physical chemistry of solutions as they occur in boilers, extending the work of Hall; (2) solubility of substances found in boiler waters between pressures of 100 lb. and 1,000 lb. per sq. in.; (3) an extension of our knowledge of the corrosion of boilers, and their auxiliaries, since no

one theory of corrosion at present fully accounts for same; (4) the heat conductivity of different types of boiler scales (extending the work of Partridge), and including scales containing oil; (5) velocity of water in different parts of boilers and their relation to corrosion, and the formation of scale at such parts. It was hoped that greater interest would be taken in these subjects, and research work carried out by chemists and chemical engineers, so that this country, pre-eminent in engineering, would not lag behind in original work on boiler feed water chemistry and associated subjects. With increasing boiler pressures, exact information on these matters was becoming more and more necessary.

Mr. Irving also made reference to the solubility of calcium sulphate and calcium carbonate at boiler pressure, and to the decomposition of soda ash. Particulars of the heat conductivity of different types of scales were referred to and interpreted in terms of fuels, and the manner in which scale forms in boilers, details of sedimentation or settling tests of materials which form boiler sludges being given. Corrosion in boilers was dealt with at length, and a description of a method of conditioning boiler feed water by a system of "colloidal conditioning" (using alignites blended with other suitable substances) was demonstrated.

Yorkshire Section : The Oiling of Wool

A MEETING of the Yorkshire Section of the Society of Chemical Industry will be held in the lecture theatre of the New Chemistry Building, University of Leeds, on Monday, March 19, when the "Oiling of Wool" will be the subject of a joint discussion to which the following contributions will be made:—"The Oiling of Wool" (Dr. J. B. Speakman), "Ionised Oils and their uses in the Wool Industries" (Professor A. T. King and E. V. Hayes Gratze); "The Use of Ionised Oils on Fibres other than Wool" (Dr. S. G. Barker).

Chemical Engineering Group

Joint Meeting with Birmingham Section of S.C.I.

A JOINT meeting of the Chemical Engineering Group and the Birmingham Section of the Society of Chemical Industry will be held at Birmingham on Friday, March 23, when Dr. D. F. Twiss will read a paper on "The Character of Rubber as a Chemically Resistant Material." On this occasion members will visit the Fort Dunlop Works of the Dunlop Rubber Co., Ltd.

Society of Dyers and Colourists

Manchester Section : Detergent and Finishing Agents

OBSERVATIONS on some of the new detergent and finishing agents were given by Mr. R. J. Hannay in a paper read before the Manchester Section of Society of Dyers and Colourists, on March 16. The author introduced his subject with a discussion on the effect of chemical constitution on lubricating values, and proceeded to compare the older type of finishing agents (such as soluble oils and soaps) with the newer ones (such as the fatty alcohol sulphonates). The various factors which arise in finishing were then reviewed and the advantages and disadvantages of each type of agent were pointed out. The points particularly mentioned were stability, both in application and to oxidation and ageing effects after application, softness, draping qualities and fullness of handle

The principles underlying scouring and cleansing action were referred to, and comparison of the different types of agents used were made. Tables showing the results of experimental work on the scouring efficiency of a number of agents were discussed. Carefully controlled conditions and the effect of altering one variable at a time was shown. One table showed the scouring efficiency of seventeen different agents in distilled water; a second table, the effect of altering the concentration; a third table, the reductions in scouring efficiency due to the use of hard water; and a fourth table set out the results given by using mixtures of soap and the new agents in distilled and hard water. The paper closed with the description of a laboratory method of evaluating the new agents. The conclusions drawn were to the effect that the new agents are certainly a distinct advance on the older ones, especially in wideness of application, stability and adaptability. They are generally superior in efficiency, but not to the very great extent that some have claimed them to be, and they are considerably more expensive to use than the older agents. This increased cost may well be justified by other factors such as improved results and labour saving. The choice of agent used requires careful consideration in order to obtain the best results owing to the fact that there is wide variation in properties between the different agents on the market.

Power from Sludge Gas

Extension of Plant at Saltley Works

THE Birmingham Tame and Rea District Drainage Board, at their meeting on February 28, decided to apply to the Minister of Health for sanction to borrow £8,850 for an extension of the sludge gas power plant at the Saltley works.

In making the recommendation the works committee stated that on various occasions the Board had been informed of the success which attended the working of the plant for the generation of power from sludge gas. The plant had been in operation for more than six years, its original capacity of 150-h.p. being increased to 950-h.p. since 1930. During 1933 the total units generated amounted to 2,666,052 units, as compared with a demand of 2,798;342 units; and as the electricity load was steadily increasing, the time had arrived for a further addition to the mechanical plant. It was recommended, therefore, that a fourth engine of 540-b.h.p. and generator be laid down and the necessary extension of the Saltley engine-house undertaken, at a total estimated outlay of £8,850. The financial aspect of the whole scheme was distinctly favourable, and in accordance with the estimates upon which it was framed. From 1927 to the end of 1933 the total value of the units generated by the Board's plant amounted to £31,625, and the cost to the Board, inclusive of loan charges and maintenance, was £18,209. The net saving effected during the period was £13,416.

Copper Development Association

An Outline of its Objects

THE organisation of the Copper Development Association is outlined in a leaflet which has just been issued. The Association was incorporated in September, 1933, to promote the use of copper, copper alloys and materials containing copper. It is a company limited by guarantee, but does not engage in any sort of commercial undertaking and has no share capital. It is financed by its members, who include all the principal copper producers of the Empire, the trade associations, and many leading companies of the British copper industry. It is directed by a board of councillors who have been nominated by the members, and administrative control is vested in a small management committee of councillors and co-opted technical members, who together represent all branches of the copper industry. An organisation has been built up which includes a permanent technical advisory staff, with offices at Thames House, Millbank, London, S.W.1.

The Association is closely in touch with research work which is being carried on in this country and abroad, but for the present it is confining its attention rather to the practical application of the considerable volume of research data which has already been collected.

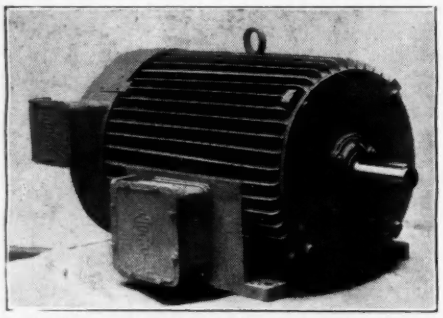
The Copper and Brass Extended Uses Council, which has been working on similar lines for a number of years, is gradually transferring the bulk of its work to the Association, which is also working in conjunction with the British Non-Ferrous Metals Research Association, the Copper and Brass Research Association in America, the Copper Institute of Germany, and other similar bodies for the interchange of data and publications. In this way the development of new uses or processes connected with copper will be encouraged by an independent organisation which has no other object than to further the interests of the copper industry as a whole.

Works Equipment News

Totally-Enclosed Flame-Proof Motors with Unique Cooling Features

VARIOUS types of flame-proof motors were exhibited by Lancashire Dynamo and Crypto Ltd., at the recent British Industries Fair. The " Fankuld " motor here illustrated, is an entirely new product of this company, and is of special interest to all chemical works as it is an absolutely totally enclosed motor. In addition, by reason of the frame cooling arrangement, machines much smaller than would normally be required for the same output (if plain totally-enclosed type were used) are possible.

These Fankuld motors are of the totally-enclosed, frame-cooled type and incorporate unique cooling features which completely eliminate the disadvantages of the earlier types of frame-cooled motors, many makes of which contained interior air passages liable to become choked with dirt and ultimately causing a breakdown. They are absolutely dust tight and it is impossible for the external atmosphere to come into contact with the motor windings, etc. The internal construction is such that the heat from the inside of the motor is conducted direct to the outer frame, which is provided with a number of axial ribs along its outer circumference. A small high efficiency fan produces a current of air which is directed along these axial ribs by means of a specially shaped fan cover,



The " Fankauld " Electric Motor (Lancashire Dynamo and Crypto, Ltd.)

which also amply protects the fan. This directional current of cooling air is generally sufficient to prevent the accumulation of any dirt between the axial ribs but any dirt which remains may easily be removed with a brush in a few seconds. Additional features of the Fankuld motors are the dust-tight terminal boxes. The ribbed frame adds to the strength and rigidity of the motor and permits of specially wide feet on all sizes. The motors are supplied in both s.c.r. and slip ring types from 2 h.p. up to 50 h.p. The smaller slip ring machines are fitted with internal slip rings; on the larger machines the slip rings are externally mounted, but in all cases the slip rings are fitted at the non-driving end. Such motors are particularly suitable for all installations where the presence of dust, grit, water, oil or fumes would be liable to damage the windings. They may be installed in flour mills, coal handling plant, crushing and grinding plant, and other dusty situations and fume-laden atmospheres.

Metallic Packing at Low Cost

A SUBJECT of peculiar interest in connection with the maintenance of chemical plant is the question of a satisfactory packing for the glands of agitator shafts, pumps, etc., especially where resistance must be offered against the action of ammonia, acids, alkalies, and corrosive gases. In this connection Haughton's metallic packing overcomes the troubles which are likely to arise. This material is composed of narrow ribbons of anti-friction metal, about $\frac{1}{8}$ in. wide and exceedingly thin. These ribbons of metal are coated with oil and graphite for lubricating purposes, and are supplied to users in loose form. For use the packing is twisted up in rope form and when compressed, by means of the gland, it forms a self-lubricating laminated mass which, although slightly compressible and possessing a slight elasticity, is practically frictionless in action and will maintain glands free from leakage at either high or low pressures. At the same time it not only is practically frictionless, but being metal throughout it is extremely durable. At some chemical works this packing is in use even for steam up to a pressure of 300 lb. per sq. in.

The appearance of the packing when compressed in the rod or shaft is shown in one of the accompanying illustrations. When in use as a pump packing it will be seen that the material, when compressed, adapts itself accurately to the shape of stuffing box and rod. It will also be readily appreciated that this packing often forms a complete remedy for

Patent Metallic Packing for Glands (Haughton's Metallic Co., Ltd.)

troublesome glands, and in those cases where ordinary forms of textile packing would fail altogether. After being pressed into position, the packing does not solidify, but always retains its laminated character and is so soft that it can be withdrawn by means of a corkscrew packing tool and cannot cause any damage to the moving plungers or shafts, even at high speeds.

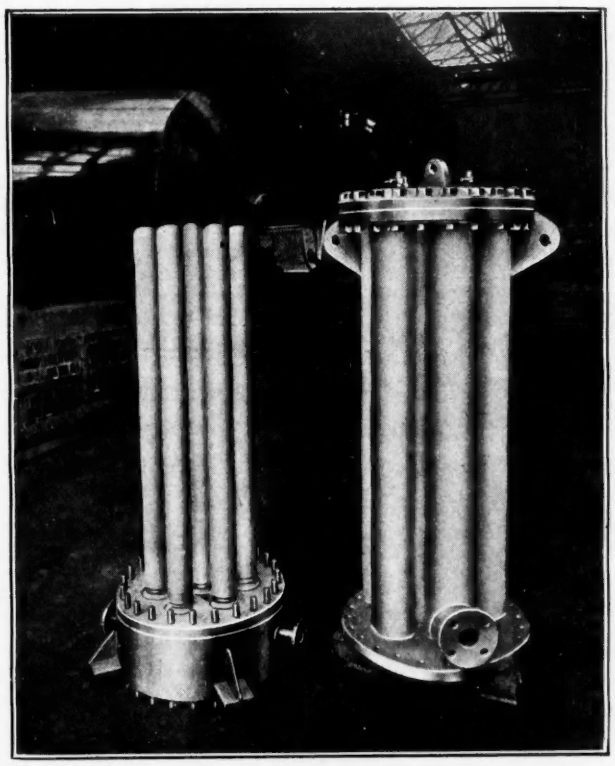
In the ordinary way metallic packings are considered to be very costly and expensive items; Haughton's metallic packing, however, has the advantage of very low cost, at the same time offering efficient results. It is supplied by Haughton's Metallic Co., Ltd., and packed in boxes of 10 and 20 lb. weight, in drums containing 2 cwt., and in the loose form. There is no waste in application, as even the smallest scraps can be utilised.

A Unique Type of Calandria

THE evaporation and heating of sulphuric acid presents many difficulties and has led Robert Jenkins and Co., Ltd., to design a unique type of calandria (which may also be used for heating). This calandria, which is illustrated, consists essentially of an outer body constructed in antimonial lead, having a number of passages similar to a revolver, and inserted into each passage is a heating element formed of a tube closed at the upper end and secured to a tube plate at the one end only. The elements are usually about 4 ft. in length, and are free to expand. The acid is circulated through the annular space between the element and the body by means

of a pump. The acid after heating enters a homogeneously lead-lined steel flash chamber where the vapour is released and passes to a barometric condenser. For removing the air and maintaining a vacuum in the flash chamber, it is usual to employ a steam operated air ejector.

Several advantages are claimed for this new design. In the first place, deposits of scale on the tube surface are negligible as evaporation only occurs in the flash chamber, whilst in addition the tube surface is scoured owing to the high velocity of acid through the annulus. Secondly, the tubes can be easily examined and cleaned by merely lifting the outer body. Thirdly, the calendria can be used as a heater for many processes, and has already been supplied for heating baths for pickling steel sheets, and for plant for the continuous removal of ferrous sulphate from pickling liquors.



Calandria for Heating and Evaporating Acid (Robert Jenkins & Co., Ltd.)

An Improvement for Gas Cylinders

HITHERTO the ordinary method of protecting cylinder valves has been by means of a hollow iron cap, open at one end. The open end is screwed internally, in order to engage with an external screwed portion or collar on the neck or shoulder of the cylinder. This method has several disadvantages, principally that the cap must be entirely unscrewed and detached from the cylinder, to obtain access to the valve. In addition, loose caps are apt to be laid aside and many get lost. The screw threads, moreover, are found to differ slightly, either originally or from use and corrosion, and during the necessary periodical heat treatment of cylinders. In practice, time is therefore wasted in finding and fitting the right cap to suit a certain cylinder, for some are too tight and others too slack. The ordinary caps also have to be rotated whilst screwing on and off, so that the screwed caps have to be sufficiently large to give rotating clearance of all parts of the cylinder valve.

The patent protecting cap, introduced by Lea and Son, is hinged in such a way that the cylinder valve can be used without detaching the cap from the cylinder and the cap cannot be mislaid or lost. As it does not require to be rotated, it can more closely follow the shape of the valve. The cap can also be locked against unauthorised interference or secured by a seal, bolt and nut, or screw. It can also be entirely removed from the cylinder during heat treatment, during examination of the cylinder, and during hydraulic testing of the cylinder. The clip which forms the securing attachment for the cap assists to support it against any strain from the taper valve shank. Such caps are less weight than ordinary screwed caps and rings for same size of valve. All the hydrogen cylinders supplied by Lea and Son will, in future, be fitted with these improved cups for the convenience of users.

Gas Cylinder Protecting Cap
(Lea & Son)

The Sigma Specific Gravity Recorder for Gas
(Sigma Instrument Co.)

A Specific Gravity Recorder for Gas

THE Sigma specific gravity recorder introduced by the Sigma Instrument Co. measures the buoyancy of a column of gas 6 ft. high by 10 in. diameter. The vacuum at the foot of the column acts on an oil sealed bell suspended from a weighted balance arm supported on knife edges. The motion is magnified and recorded and a small flow of gas maintains a fresh sample in the gas column.

The bell in this instrument is fixed to an arm which is pivoted to the left of the bell. Its motion is transferred to a main vertical lever. Correction for atmospheric temperature and pressure is made by change of length of the main lever of the magnifying mechanism; this is done by the expansion or contraction of an enclosed volume of air which alters the position of the link connecting the main lever to the pen

lever, thus increasing or diminishing the leverage as required. The upper end of the main lever is cam-shaped to accurately correct for changes of temperature and pressure. Numbers corresponding to the tabular number are engraved on the lever, and a valve is provided for adjusting the volume of air to make the link position correspond to the tabular number. The clock runs for 14 days, and the standard chart lasts for 14 days. The standard range of ruling of the chart is for specific gravity from 0.4 to 0.65. The recorder is sensitive and robust; it is suitable for use in the retort house, the exhauster house, or the laboratory.

Moisture-Resisting Cotton Bags

MANY classes of products, including fine drugs and chemicals, dry colours, food preparations, etc., when shipped abroad in cotton bags, are apt to deteriorate from the effects of moisture, and in certain damp tropical countries it is difficult, if not impossible, to keep such materials in their original packages. Export houses have found that food products in the ordinary bags, when exposed for only a brief time to rain, will deteriorate, and the shippers and manufacturers may find such packages and their contents sent back to them.

There has therefore long been a demand for a cotton or other textile bag which is impervious to moisture, or moisture resisting, for putting up materials of the class referred to for export. Such bags must not affect their contents, must show no change in colour, texture or strength from the ordinary cotton bag, and they must be offered at a price which will not lessen the demand, but, on the contrary, should rather stimulate demand. W. H. Feltham and Son, who have had many years' experience in the trade as actual manufacturers and printers of cotton bags, have, after some years of experimenting, discovered a preparation which renders their cotton bags moisture-resisting, and at the same time meets all the requirements above mentioned. A sample of this cloth, which has been submitted to us, shows that there is nothing in its appearance or feel to distinguish it from ordinary cotton, and yet, as tests show, it is decidedly moisture-resisting, and should therefore supply the long-desired protection against the effects of humid atmospheres.

Steel Pipes for Chemical Works

ONE of the most striking features of engineering during recent years is the great advance which has been made in the use of steel pipes for water, compressed air, and other purposes, as against cast iron and compositions of ferro-concrete and cement asbestos ("cement fabric"). For example, about 30 years ago the production of cast iron and steel pipes in Great Britain was equal, being in each case of a value of about £1,000,000. To-day, however, the British output of steel pipes is valued at £10,000,000, as against, say, £2,500,000 for cast iron pipes, and while it is difficult to obtain figures for the world production of steel, cast iron, wrought iron and cement fabric pipes, there is no question that steel has made gigantic advances.

The matter is of interest to the chemical and allied industries because, following upon the greatly extended use of steel for water mains, many chemical works in the United States are now adopting steel pipes. Incidentally, of course, it is hardly necessary to emphasise that for steam pressures the steel main is supreme, just as in the case of petroleum and natural gas, as well as salt water and fresh water, in the petroleum industries. In the United States over 250,000 miles of steel mains are now operating for oil alone, representing a total of more than 8,000,000 tons of steel, quite apart from a vast mileage of natural gas mains. Steel is also supreme for hydro-electric mains, in which connection the total installed plant in all countries now has a capacity of over 40,000,000 h.p. and such steel mains in many cases operating at heads up to 3,000 feet and over. Developments in connection with the use of long-distance steel mains for coke oven gas in Germany are also of interest to the chemical engineer. Already a huge network of these mains is operating for the supply of coke oven gas from the Ruhr to towns extending to a distance of 200 miles, while there has long been talk of extending the mains across Germany as far as Berlin.

With regard to the advantages of steel for pipe lines, it may be pointed out that steel has an extremely high tensile strength, and consequently steel pipes can be made to stand almost any pressure, while it is also practically impossible to burst a steel pipe or to damage it seriously during transport and laying. These latter points are of particular importance as against the cast iron and cement fabric pipes, which are liable to breakage and bursting. Some of the figures with regard to the amount of breakage in connection with the conveyance, handling, and laying of cast iron pipes are almost incredible, while it is well known, of course, that the bursting of cast iron water mains is becoming a serious problem in large towns. Highly important is the fact that steel is absolutely impermeable under any conditions of pressure. This is different to the cement fabric pipe, which even at medium pressures, such as several hundred pounds per square inch, is liable to "sweat" badly; that is, particles of water are forced bodily through the pores, which in itself is not only objectionable but has the serious disadvantage of the water becoming contaminated by the surrounding soil.

Steel is much thinner and lighter for the same duty, especially as compared with cast iron or cement fabric, while longer pipe lengths are also available. Consequently the steel pipe line lends itself to very rapid laying, using individual lengths up to, say, 40 feet. Such pipe lengths can be joined together by welding. Corrosion is no longer a serious problem for the steel pipe because of the modern methods now being adopted, which consist essentially in the use of bitumen. The latter is first applied to the very hot pipe immediately after manufacture, when it adheres with great tenacity, forming a resistant film, while further protection can be given by means of bitumen-saturated jute cloth or the use of sheeting, say, ¼ in. thick, of a tough seamless bituminous composition. These methods give protection against corrosion in the most effective manner, and especially against an acid atmosphere, fresh or salt water and corrosive soil.

Drug and Fine Chemical Workers

National Ballot on New Agreement

THE Executive Council of the Chemical Workers' Union is carrying out a national ballot among members employed by 67 of the principal firms in the drug and fine chemical trades employing over 20,000 workers, male and female, to secure adoption of new standard terms. In order that the council can submit these new terms direct to each firm concerned a 75 per cent. majority in favour of the terms has to be secured in the ballot. The campaign to secure workers' support for the new terms has been in progress since March, 1933. Meetings held to date indicate that the 75 per cent. majority will be secured. Ballot papers are returnable not later than March 21, and the result will be known on March 26.

Principal changes proposed are as follows:—

	Existing Conditions.	New Terms.
Hours:	48	40
Overtime (Normal)	1¼ first 2 hours. 1½ after.	1½ Time all through.
,, (Sundays, Holidays).	Double Time.	Double Time.
Holidays (Annual)	6 days.	12 days together with payment for Bank and statutory holidays now paid for.

Wages:

Foremen and chargehands:—			Foremen	100/-
			Forewomen	50/-
			Chargehand	90/-
			,, (Female)	45/-
Males:—Grade	I.	60/-	Grade I	80/-
	II.	55/-	II	70/-
	III.	50/-		
Females:—Grade	I.	34/-	Grade I	40/-
	II.	28/6	II	35/-
Juniors:—Males		11/6 to 36/6		14/- to 60/-
Females		11/- to 25/-		14/- to 30/-

Among the new proposals are:—Limitation of juniors (14-20) one to four adults; termination of employment—for reasons other than misconduct—compensation = 2 weeks wages for each complete year's service; sick pay—28 days' full pay each year on production of medical certificate.

Welding to Re-build Worn Parts

A Chart for the Plant Repair Shop

THE following information is condensed from a larger chart which was published in "Oxy-Acetylene Tips," November, 1933. It should be of special interest to chemical manufacturers who do their own welding jobs.

	Operation.	*Purpose of Operation.*	*Nature of Metals*	*Type of Surface Obtained.*
A	Bronze-surfacing with a rod such as the one of new wear-resisting bronze rods.	For building up worn surfaces; low-melting point rod for ease of application and easy machining; for wearing surfaces in lubricated places or non-lubricated places where low heat prevails.	Cast iron, alloy and semi-steel, carbon steels, alloy steels, malleable iron, wrought iron, copper-base alloys, Monel metal, nickel.	Surface can be easily machined to close tolerance.
B	Resurfacing with rod of same composition as base metal or very similar.	To restore part to original condition and size.	All metals ordinarily fusion-welded, and heat-treated alloys that can be given subsequent heat-treatment to restore physical properties.	Can be machined with same facility as base metal.
C	Resurfacing with rod similar to but not same as base metal, such as an alloy steel rod with air-hardening properties.	To restore a worn part to original size and give a deposit that may be subsequently forged, heat-treated, or left as welded in a condition superior to original in hardness and toughness.	Carbon steels, wrought iron, low alloy steels. Should not be applied to heat-treated steels except in special cases.	Usually not easily machined, but can be easily ground, forged or heat-treated.
D	Hard-surfacing with iron-base wear-resistant alloys (chromium-manganese-iron alloys such as Haschrome).	For parts subjected to moderate abrasive wear or severe impact; greater hardness and wear resistance than (C) and used as base materials under the more wear-resistant non-ferrous alloys (E)(F).	Carbon steels, low-alloy steels though in some cases heat-treatment after application may be necessary; alloy and semi-steel castings; gray cast iron.	Can be ground to close tolerance; can be forged or heat-treated if necessary.
E	Hard-surfacing with non-ferrous, wear-resistant alloys (cobalt-chromium-tungsten alloy, e.g., Stellite).	For resistance to severe abration and especially for resistance to abrasion at elevated temperatures as the hardness of these alloys is retained at a red heat.	Same as (D); also Monel metal and high-chromium (stainless) steels.	Grinding finish to very close tolerance; no forging possible and unaffected by heat-treatment; cannot be machined.
F	Hard surfacing with diamond substitutes (tungsten carbide) or a composite rod consisting of crushed particles of tungsten-carbide in a bonding material.	For parts subjected to extremely severe abrasion.	Carbon steels (heat-treatment often necessary); low-alloy steels (heat-treatment often necessary); alloy, semi-steel, gray iron castings.	Surface used as originally applied.

Public Health Congress

Preliminary Programme for Norwich

PRELIMINARY details have been issued of the congress of the Royal Institute of Public Health, which will be held at Norwich from May 15 to 20. Lord Leverhulme is president of the Institute, and Alderman H. N. Holmes, ex-Lord Mayor of Norwich, will be president of the congress. A discussion on "The Milk Problem" will be opened by Dr. T. Ruddock-West, County Medical Officer of Health, Norfolk, and among the many papers to be read during the congress are the following:—"The Chemist in the Food Industry," by Dr. J. W. Corran, of Carrow Works, Norwich. "Vitamins from Marine Sources," by Dr. J. A. Lovern, Torry Research Station, Aberdeen. "The Weakness of Pasteurisation as a Means of Safeguarding the Milk Supply," by Sir Daniel Hall, director of the John Innes Horticultural Institution. "The Canning of Fresh Fruit and Vegetables in relation to Health," by Mr. Theodore Rendle, technical manager, Chivers and Sons, Ltd., Histon, Cambridge.

British Trade with Salvador

A Downward Tendency in 1931

THE proportion of the import trade of Salvador enjoyed by Great Britain was 13 per cent. in 1928 and 1930, reaching 14½ per cent. in 1929. Since then it has decreased, being 12 per cent. in 1931 and 11 per cent. in 1932. A compensating rise occurred during the last two years in the case of Germany, whose percentage increased from 8½ to 9.4 per cent.

In his report on "Economic Conditions in the Republic of El Salvador" issued by the Department of Overseas Trade (H.M. Stationery Office, 1s. 9d.), Mr. F. M. Shepherd, acting British Consul at San Salvador, states that the United States supplies 50 per cent. of the total chemical products imported, Germany taking second place and the United Kingdom third. The preponderance of the United States is even greater in the case of pharmaceutical products, being some 60 per cent. of the total. France and Germany come second and third, with Great Britain fourth. The British proportion has, however, remained steady. The United Kingdom share of the paint and varnish trade was 24 per cent. in 1931.

News from the Allied Industries

Artificial Silk

LETTERS OF ALLOTMENT AND REGRET in connection with the issue of £2,800,000 British Celanese 5½ per cent. mortgage debenture stock were posted on Saturday, March 10. Conversion applications were extremely heavy, and it is understood that cash applications from shareholders, bond and debenture-holders, received on an average only 15 per cent. of their requirements. Applications from the general public were entirely ruled out.

Iron and Steel

THE ANNUAL REPORT of the United States Steel Corporation for 1933 states that the corporation's plants operated at approximately 29 per cent. of capacity, compared with 18 per cent. in 1932. The production of finished goods totalled 5,536,000 tons, against 3,591,000 tons in 1932. Since the adoption of the N.R.A. code, wages and salaries advanced by 25 per cent. over those in June, 1933, which amount is only partially offset by increased prices realised in the last five months of 1933.

Non-Ferrous Metals

CONSEQUENT UPON THE INCREASED CONSUMPTION of nickel, the International Nickel Co. of Canada reports a net profit of $9,662,584 for 1933 in place of a net loss of $135,345 for 1932. Sales of nickel in all forms, including nickel in alloys, amounted to 74,356,969 lb., compared with 36,406,935 lb. in 1932, an increase of 116 per cent. The world's consumption of nickel in all forms aggregated 96,000,000 lb., compared with 57,000,000 lb. in 1932 and 73,000,000 lb. in 1931.

A MEETING OF THE INTERNATIONAL ZINC CARTEL has been convoked for March 23, at Paris, to discuss whether further output restriction is advisable. At the last meeting of the cartel, on December 11, 1933, the proposal of reducing the quota of production from 50 to 45 per cent. was rejected in anticipation of an improvement of the market situation.

Safety Glass

LANCEGAYE SAFETY GLASS, LTD., held an extraordinary general meeting on March 7, when a reconstruction scheme was approved. A new company is to be formed, with a capital of £120,000 in 1s. shares, to take over the present undertaking. Existing shareholders are entitled to one fully-paid 1s. share for every three shares now held, and also to two 1s. shares, 6d. paid. The whole of the partly-paid shares are to be underwritten. The chairman, Mr. M. G. Livermore, said that sales for the past two months showed an increase of 50 per cent. According to the "London Gazette," March 9, Mr. Roddison Douglas Brewis, F.C.A., has been appointed liquidator for the voluntary winding-up of the existing company.

China Clay

FEBRUARY HAS BEEN RATHER AN UNEVENTFUL MONTH and through the unsettled state of some of the markets and adverse sailing conditions the total volume of trade done has scarcely come up to expectation. The shipments, however, were as follows:—Fowey, 26,687 tons china clay, 2,839 tons china stone, 193 tons ball clay; Charlestown 7,329 tons china clay, 44 tons china stone; Par, 6,906 tons china clay, 495 tons china stone; Padstow, 928 tons china clay; Looe, 544 tons china clay; Penzance, 351 tons china clay; Plymouth, 148 tons china clay; Newham, 48 tons china clay; by rail, 5,071 tons china clay, representing a total of 48,011 tons of china clay, 3,378 tons of china stone, and 193 tons of ball clay, aggregating a total of 51,383 tons compared to the previous month of January of 60,465 tons.

Continental Chemical Notes

THE KRUPP INTERESTS are putting in hand a scheme for complete overhaul of their mining properties.

* * *

A SECOND LITHUANIAN GLUCOSE FACTORY will engage in syrup and potato starch manufacture. The first factory commenced operations last year.

* * *

THE NEW FRENCH CELLULOSE CONCERN, the Société des Produits Cellulosiques (capital 15,000,000 francs), which took over the rayon plant of the Textiles Chimiques du Centre, is expected to be in production at the end of this month.

* * *

AN IMPORTANT MERGER in the Italian coal products industry is reported by the "Chemische Industrie," the participants being the Italgas, the Soc. Torinese Industrie Gas ed Elettricita (Stige) and the Soc. Italiana per l'Industria del Gas (Turin).

* * *

REGARDING POSSIBLE REPERCUSSIONS upon the world market of the starting up of the new Russian potash workings at Solikamsk, the current issue of "Metallbörse," at the close of a critical analysis, concludes that the Russian supplies cannot be expected to effect the situation for at least 5 to 10 years.

* * *

RECENT SOVIET DEVELOPMENTS (reported in the "Chemische Industrie," March 10) include the production of dimethylaminophenyldimethylpyrazolone by the "Pharmakon" concern (Leningrad); a new process for the production of various vitamins worked out in the Leningrad Nutrition Research Institute; a furfural plant at Armawir and extension of the existing furfural factory at Odessa; a new process for terpene hydrate (Leningrad Pharmaceutical Institute); and manufacture of alcohol by wood hydrolysis at Czerepowez.

TWO RECENT CARTEL AGREEMENTS concluded in Czechoslovakia embrace all important interests in the oxygen and porcelain industries respectively.

* * *

UNDER THE AUSPICES of the Hungarian Ministry of Agriculture, a large area will be placed under poppy cultivation in the vicinity of Szolnok, and an alkaloid factory is to be erected.

* * *

OWING TO THE CATASTROPHIC STATE of the wood distillation products market, no less than 75 per cent. of the wood charcoal accumulated by the Carpathian-Russian (Czechoslovakia) producers was used on the spot as fuel during the past year.

* * *

AN ELECTRICAL APPARATUS serving the threefold purpose of measuring hydrogen ion concentration, detecting the degree of corrosion on metallic surfaces and carrying out potentiometric titrations is described in the "Chemiker-Zeitung," March 7.

* * *

ZINC OXYPHOSPHATE, in which a certain proportion of finely divided metal is distributed, has been proposed by a French worker as a dental cement. Chemically pure tin in the crystalline form is specified, in particular, as the metallic component (German Patent 584,720).

* * *

THE PRESENT NORWEGIAN WHALING CAMPAIGN in the Antarctic has resulted in a yield of over two million barrels of whale blubber, but pessimism prevails because forward sales only represent 7 per cent. of this quantity. Failing improved market conditions, it is quite on the cards that the fleet will lay up for the 1934-35 season. During its first year of operation, the Soviet whaling fleet accounted for 203 whales with an average weight of 58 tons.

From Week to Week

ALTERATIONS AND EXTENSIONS are to be carried out at Denny Paper Mills, Stirlingshire.

IN HONOUR OF DMITRI MENDELEEV, the centenary of whose birth occurs this year, a special series of postage stamps has been issued in Soviet Russia.

MR. GEOFFREY HEYWORTH (a director of Lever Brothers, Ltd.), and Dr. J. L. Polak (a director of Van den Berghs, Ltd.) have been appointed members of the board of Unilever, Ltd.

BORAX CONSOLIDATED, LTD., inform us that on and after March 19 their address will be Regis House, King William Street, London, E.C.4 (Tel.: Mansion House 8332 and 1714).

MR. CHARLES NETTON RADCLIFFE, for many years a member of the council of the Rubber Growers' Association, who died on January 30 last, left gross estate valued at £48,975, with net personalty £48,805.

IMPERIAL CHEMICAL INDUSTRIES, LTD., have informed Ayr County Council that they are to extend their works at Ardeer, Stevenson, and will close existing explosive factories in England and other parts of Scotland.

MR. A. G. OGSTON has decided to relinquish the chairmanship of Ogston and Tennant, Ltd., Renfrew, Aberdeen and London, the well-known soap manufacturers. The chairmanship devolves upon Mr. W. W. Watt, the present managing director of the company.

MR. H. J. REYNOLDS, of Wolverhampton Gas Works, in a paper read before the Birmingham Junior Gas Association on Thursday last, on "Crude Benzol Recovery," insisted that benzol recovery from coal gas was a sound paying proposition, whether from horizontal, inclined or vertical retort gas. He said there was a shortage of benzol, and a good demand.

ELECTIONS TO MEMBERSHIP of the Institute of Physics include: Fellows—Professor G. B. Bryan, Professor W. E. Curtis, Professor R. H. Fowler, Professor P. Kapitza, P. A. Mainstone, Dr. E. Mallett, Professor E. A. Milne, Dr. F. S. Sinnatt, and L. R. G. Treloar. Associates—J. A. Darbyshire, A. G. Gaydon, H. W. Hall, D. I. Lawson, K. V. K. Murthy, D. Taylor and H. H. Watson.

GENERAL BLOOD POISONING, but not sufficient evidence to show the ingress of the poison, was recorded by the Liverpool coroner, at an inquest held on Monday, on Frederick Tolman, aged 60, of Walton, an assistant at the City Laboratories, Mount Pleasant, Liverpool. It was stated that Mr. Tolman was constantly receiving cuts and scratches in cleaning test tubes and attending to small animals and their cages.

APPROXIMATELY 350 MEN AND WOMEN WORKERS are affected by the decision of the shareholders of Joseph Nathan and Co., Ltd., proprietors of the Glaxo laboratories, to institute a pensions scheme. In a circular issued to the shareholders before the meeting, the board explained that the scheme is only the forerunner of a more comprehensive one. The directors had previously inaugurated an unofficial scheme, which they state has proved of considerable value in achieving stability among the more important members of the staff.

CHEMICALS, DRUGS, DYES AND COLOURS imported into the Irish Free State during the year ended December 31, 1933, amounted to a total value of £1,061,275, as compared with £1,121,555 in the previous year. The value of chemical fertilisers imported during the year was £307,884, as against £476,089 in 1932. Imports of chemicals in December last amounted to £77,312, as compared with £56,392 in the corresponding month of the previous year while fertilisers totalled £23,826, as against £29,206 in December, 1932.

ALDERMAN EDWIN THOMPSON, Lord Mayor of Liverpool in 1930-31, has been nominated president for 1934-1935 of the Society of Chemical Industry, which holds its annual conference at Cardiff on July 16 and 17. Alderman Thompson is governing director of Thompson Capper Wholesale, Ltd. He is on the general committee of the British Association, and in 1923, when it visited Liverpool, did valuable work as hon. secretary. In 1924-25 he was chairman of the Liverpool Section of the Society of Chemical Industry. He originated the idea which led to the formation of the Lancashire Industrial Development Council.

RUSSIA'S BID FOR A SHARE of the world's canning trade was mentioned by Mr. T. N. Morris, of the Low Temperature Research Station, Cambridge, in a paper read at a meeting of the Royal Society of Arts on February 28. Soviet Russia, said Mr. Morris, is making vast plans for developing the canned food industry and their potential output is already 1,250,000,000 cans annually. It was reported that they contemplated an ultimate production which would put them on the same plane as America, where, in 1929, 100,000 workers were employed, and something like 10,000,000,000 cans produced. There seemed to be no reason why Britain should not develop an export trade in canned goods, despite technical difficulties.

MR. JOHN WILLIAM BROWN, a director of Johnson, Matthey and Co., Ltd., died on March 11.

THE DEATH IS ANNOUNCED, at the age of 79, of Sir William D. Henry, a director of numerous tin companies, including the Anglo-Oriental Mining Co., and the London Tin Corporation.

MR. ANTHONY BRUNNER, elder son of the late Mr. Roscoe Brunner (chairman of Brunner Mond and Co.), and Miss Amy Phyllis Ivy Whittaker, were married in London last week.

EXPORTS OF CHEMICALS, drugs, dyes and colours during February were valued at £1,416,889, being £40,086 higher than February, 1933. Imports were £880,726, an increase of £234,324; re-exports were £47,287, an increase of £13,649.

MAJOR W. G. MOORE, managing director of Donside Paper Co., has resigned in order to join the Clyde Paper Co., Ltd., and Mr. E. Kirkup, head paper maker and works manager has been appointed general manager at Donside.

AS THE RESULT OF AN EXPLOSION four persons are reported to have been killed at the Hercules Powder Company's Packing House at Kenvil, New Jersey. The explosion occurred in the dynamite department.

MR. GEORGE E. JORDON, general manager at the Stoneywood Paper Mills of Alex Pirie and Sons, Ltd., Stoneywood, has been presented with a silver tea service to mark his retiral after 52 years' service.

DR. E. L. HIRST, who has been selected by the Council of the Royal Society for admission to its Fellowship, is a senior lecturer in chemistry in the University of Birmingham. His first research in chemistry, on a constituent of cellulose, was published with Professor W. N. Haworth, head of the Department of Chemistry at Birmingham University, with whom Dr. Hirst has been closely associated during the past 18 years. He has taken a prominent part in researches on carbohydrates, and recently has elucidated the constitution of ascorbic acid (Vitamin C.)

AFTER AN ILLNESS LASTING TWO YEARS, Mr. Stanley Bowman, F.I.C., of Teddington, has died. Mr. Bowman was formerly in the analytical department of Allhusen's Chemical Works, Gateshead. During the war he joined the staff of the Royal Naval Dockyard at Chatham, where he served as analytical chemist, and later was appointed chief analytical chemist for the Medway Division. Subsequently he became a member of the research department of the Anglo-Persian Oil Co.

THE MANAGEMENT COMMITTEE of the British Industries Fair at Birmingham has passed a resolution in favour of altering the date of the Fair from February-March to May-June; and has written to the authorities in London expressing the hope that the two sections of the Fair in London will also be changed to the latter date. Birmingham is strongly in favour of making the change, and the Committee has behind them the support of many of the largest and most influential exhibitors. A committee representing the London and Birmingham Sections has been appointed to consider the matter.

THE BRITISH STANDARDS INSTITUTION has issued its half-yearly handbook and indexed list of British Standard Specifications. The section devoted to current lists of British Standard Specifications includes a numerical list, the new specifications in course of preparation, and a complete subject index. This index should be in the hands of all drawing offices and purchasing departments of public authorities and firms throughout the building, chemical, engineering and allied industries who have found the British Standards of such assistance in the preparation of contracts and tenders. Copies of this useful publication (under Reference C.D. 2,000) are available from the British Standards Institution (Publications Department), 28 Victoria Street, London, S.W.1, price 1s. 2d., post free.

ADDITIONAL IMPORT DUTIES (No. 4) ORDER, 1934 (S.R. and O. 1934, No. 177), increasing the existing duty of 10 per cent. ad valorem on di-sodium and tri-sodium phosphates to £1 15s. per ton, and £2 10s. per ton, respectively, has been published by H.M. Stationery Office, together with the recommendations of the Import Duties Advisory Committee, to which they respectively give effect. This Order came into operation on March 6. The committee state in their report that the manufacture of commercial di-sodium and tri-sodium phosphates was revived in this country in 1931, but during the last two years the output for all purposes has been considerably less than the total productive capacity of United Kingdom manufacturers, and Continental phosphates are being delivered in this country at prices which are lower than the British cost of production, notwithstanding the imposition of the general ad valorem duty. The committee are satisfied that plant available in this country will be able to supply all the needs of United Kingdom industries using these chemicals and that the moderate increase of duty will have a negligible effect upon industries concerned.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

DURING the week a fairly satisfactory volume of business has been transacted. Quotations are steady and the demand for industrial chemicals continues to be fairly active. Acetone, formaldehyde, formic and oxalic acids have been notably in demand; some interest also being shown in acetic acid, anhydrous ammonia, sodium bicarbonate and alkali. Improved business is reported in ammonium chloride. Trade in coal tar products has been normal and most prices are unchanged, although a reduction has been reported for xylol. Some large orders have been placed for refined coal tar. The pharmaceutical chemical market is steady. The principal price changes are reductions for acetyl salicylic acid, salicylates and salicylic acid. The essential oils market has only been moderately busy.

LONDON.—The demand continues fairly active with practically no changes in the price structure with the exception of permanganate of potash, prices for which have been advanced by ¼d. per lb. The coal tar products market continues to be firm and prices are unaltered from last week.

MANCHESTER.—A fair volume of business has been transacted at Manchester during the past week in alkali, caustic soda, and some of the other leading soda products, and also in carbonate and caustic potash, with a sprinkling of orders among the heavy acids and miscellaneous materials. For the most part, however, buyers have not ventured any distance ahead and seem to be content for the time being to cover requirements over the next few weeks. The market feeling is that fresh contract bookings of any consequence will now be postponed until after Easter. Although here and there values are being shaded a little, the general tendency of prices remains undoubtedly steady. Some of the lighter tar products are, perhaps, the chief exceptions, and quotations in a number of these have further eased slightly. Crude tar however appears to be fairly stable at the moment, with supplies being taken up.

SCOTLAND.—There has been a slight increase in activity in the Scottish heavy chemical market.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £15 10s. per ton; powder, £28 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—LONDON: 9½d. per lb.; less 5%. MANCHESTER: 9¼d. to 9½d.

ACID, CRESYLIC.—97/99%, 1s. 1d. to 1s. 7d. per gal.; 98/100%, 1s. 5d. to 2s.

ACID, FORMIC.—LONDON: £47 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON: 11½d. per lb. SCOTLAND: B.P. crystals, 11.d, carriage paid. MANCHESTER: 1s. 0½d.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £20 at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BARYTES.—£7 to £8 10s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—2s. 7d. to 2s. 11d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3½d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £3 19s. per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £27 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 to £36; brown, £31 10s.

LEAD NITRATE.—£28 per ton. MANCHESTER: £28.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised Industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 9d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 9¼d., according to quantity in 2-cwt. drubs; B.P., 9d. to 9¾d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.

RUPRON (MINERAL RUPBER).—£16 10s. per ton.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. net.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£12 10s. per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.

SODIUM SILICATE.—140° Tw. Spot £8 per ton d/d station, returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £15 15s. per ton f.o.b. ton f.o.b.

SULPHUR.—£10 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.

ZINC SULPHIDE.—11d. to 1s. per lb.

Pharmaceutical and Fine Chemicals

The following changes in the prices of pharmaceutical and fine chemicals are announced :—

ACID, CITRIC.—9¼d. per lb.

ACID, TARTARIC.—1s. 0¼d. per lb.

AAID, ACETYL SALICYLIC.—2s. 7d. to 3s. 4d. per lb.

ASPIRIN.—2s. 7d. to 3s. 4d. per lb., according to quantity.

SODIUM SALICYLATE, B.P., Powder or Crystal.—1s. 8d. to 2s. 6d. per lb., according to quantity.

SALICYLIC ACID, B.P., Powder or Crystal.—1s. 6d. to 2s. 3d. per lb., according to quantity.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 9d. per lb.; crude, 60's, 2s. 11d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 4d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale, 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

ANTHRACENE OIL.—Strained, 4½d. per gal.

BENZOL.—At works, crude, 10d. to 10½d. per gal.; standard motor 1s. 5d. to 1s. 5½d.; 90%, 1s. 5½d. to 1s. 6d.; pure, 1s. 8½d. to 1s. 9d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.

CREOSOTE.—B.S.I. Specification standard, 3½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3¼d. f.o.r North; 4d. to 4½d. London. MANCHESTER: 3½d. to 4¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 99/190%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140, 6s. to 6s. 6d. per gal.

TOLUOL.—90%, 2s. 6d. per gal.; pure, 2s. 9d.

XYLOL.—Commercial, 2s. 6d. per gal.; pure, 2s. 8d. to 2s. 10d. 2s. 10d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.

p-CRESOL 34-5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C. 9½d.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 5s. in casks, in 1-ton lots.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 10d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buver's works.

p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £16 to £17. Liquor, brown, 30° Tw., 7d. to 9d. per gal. MANCHESTER: Brown, £12 10s.; grey, £17.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.

CHARCOAL.—£6 10s. to £10 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 9d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.

WOOD TAR.—£2 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station. Export.—Nominal, £5 17s. 6d. per ton f.o.b. U.K. ports in single bags.

CYANAMIDE.—£7 6s. per ton carriage paid to any railway station in Great Britain in lots of 4 tons and over.

BRITISH NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

CHILEAN NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

NITRO-CHALK.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station.

NITROGEN PHOSPHATE FERTILISERS.—The prices of these products for delivery up to June next in 6-ton lots to farmer's nearest station range from £10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

HULL.—LINSEED OIL.—Spot was quoted at £19 10s. per ton; March, £19; April, £19 2s. 6d.; May-Aug., £19 7s. 6d.; Sept.-Dec., £19 17s., naked. COTTON OIL.—Egyptian, crude, spot, £13; edible, refined, spot, £15 5s.; technical, spot, £15 5s.; deodorised, £17 5s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £14 15s., naked. GROUNDNUT OIL.—Extracted, spot, £18 10s.; deodorised, £22 10s. RAPE OIL.—Extracted, spot, £23 10s.; refined, £25. SOYA OIL.—Extracted, spot, £16 10s.; deodorised, £19 10s. per ton. COD OIL, 22s. 6d. per cwt. CASTOR OIL.—Pharmaceutical, 36s.; first, 31s.; second, 28s. per cwt. TURPENTINE, American, spot, 53s. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

SYNTHETIC RESINS.—I. Rosenblum. June 1, 1931. 406,652.

TREATMENT OF TEXTILE MATERIALS made of or containing cellulose esters or ethers.—British Celanese, Ltd., G. H. Ellis and E. W. Kirk. July 23, 1932. 406,653.

ANTHRAQUINONE DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., N. H. Haddock and F. Lodge. Aug. 2, 1932. 406,689.

SEED DISINFECTANTS and their application, manufacture.—Imperial Chemical Industries, Ltd., and F. L. Sharp. Aug. 3, 1932. 406,723.

MERCURATED HYDROCARBONS, manufacture.—Imperial Chemical Industries, Ltd., and F. L. Sharp. Aug. 4, 1932. 406,725.

AMIDES of higher fatty acids, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 17, 1932. 406,691.

PHENOLS, preparation.—G. B. Ellis (Soc. des Usines Chimiques Rhone-Poulenc). Aug. 22, 1932. 406,646.

PRODUCTION OF PAPER or like cellulosic material having a marbled or like appearance, process and apparatus for.—A. Diamand. Aug. 29, 1932. 406,661.

ALIPHATIC AMINES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Sept. 1, 1932. 406,700.

ANTHRAQUINONE DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., N. H. Haddock, F. Lodge, and C. H. Lumsden. Sept. 1, 1932. 406,733.

PAINTS AND VARNISHES, manufacture of products for use in the preparation.—Imperial Chemical Industries, Ltd., A. Hill and E. E. Walker. Sept. 5, 1932. 406,738.

CONCENTRATION OF ORES by flotation.—International Nickel Co. of Canada, Ltd. Sept. 23, 1931. 406,741.

HARDENING GELATINE PHOTOGRAPHIC LAYERS, processes.—O. Bloch and J. Mitchell. Sept. 8, 1932. 406,750.

AZO DYESTUFFS containing metals, manufacture and production. J. Y. Johnson (I. G. Farbenindustrie). Sept. 29, 1932. 406,778.

AMINOALKYLSULPHONIC ACIDS and salts thereof, manufacture.—W. W. Groves (I. G. Farbenindustrie). Oct. 10, 1932. 406,788.

CATALYTIC DEHYDROGENATION of partially or wholly hydrogenated polynuclear hydrocarbons.—J. Y. Johnson (I. G. Farbenindustrie). Nov. 4, 1932. 406,808.

HARD CEMENTED CARBIDE MATERIALS.—A. H. Stevens (Firth-Sterling Steel Co.). Nov. 18, 1932. 406,822.

MONOBASIC ALUMINIUM SULPHITE, production.—T. Goldschmidt Akt.-Ges. Jan. 25, 1932. 406,855.

EMULSIONS OF WAXES.—Deutsche Hydrierwerke Akt.-Ges. Feb. 17, 1932. 406,862.

INDIGOID DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. July 15, 1932. 406,914.

PHOTOGRAPHIC BLEACHING-OUT LAYERS.—I. G. Farbenindustrie. July 21, 1932. 406,917.

HIGHLY-EXOTHERMIC OXIDATION PROCESSES, process for carrying out.—W. W. Triggs (Zahn and Co., Ges.). July 24, 1933. 406,919.

ALCOHOLS, production.—H. T. Bohme Akt.-Ges. Sept. 3, 1932. 406,714.

CELLULOSE HYDRATE FILMS or skins, method of making extremely thin glass-clear.—J. P. Bemberg Akt.-Ges. Sept. 3, 1932. 406,715.

FLUORESCENT MATERIAL.—Siemens-Reiniger-Werke Akt.-Ges. Oct. 24, 1933. 406,957.

METALLIC MAGNESIUM, production.—Oesterreichisch Amerikanische Magnesit Akt.-Ges. Nov. 30, 1932. 406,958.

DISTILLABLE CARBONACEOUS MATERIALS, treatment with hydrogenating gases.—J. J. V. Armstrong (International Hydrogenation Patents Co., Ltd.). Sept. 8, 1932. 406,963.

Complete Specifications Open to Public Inspection

COPPER SULPHATE, manufacture.—M. Serciron. Sept. 1, 1932. 943/33.

OXYCHLORIDES OF COPPER and of anticryptogamic products containing them, manufacture.—M. Serciron, Sept. 1, 1932. 945/33.

OIL SOLUBLE HARDENING PHENOL ALDEHYDE RESINS, process for the preparation.—Dr. H. Hönel, J. Ehrenfeld and O. Reichhold. Aug. 30, 1932. 8693/33.

OXYGENOUS NICKEL or nickel-copper compounds, reduction.—Falconbridge Nikkelverk Aktieselskap. Aug. 27, 1932. 22793/33.

FUNGICIDAL AND INSECTICIDAL MATERIALS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 2, 1932. 23256/33.

4-AMINODIPHENYLAMINE DERIVATIVES, manufacture.—I. G. Farbenindustrie. Aug. 31, 1932. 23943/33.

PROTECTION AGAINST MOTHS, manufacture of compounds useful for.—J. R. Geigy Akt.-Ges. Sept. 3, 1932. 23944/33.

BASIC TRIPHENYLMETHANE DYESTUFFS soluble in water, manufacture.—I. G. Farbenindustrie. Sept. 3, 1932. 24473/33.

MONOAZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. Sept. 2, 1932. 24475/33.

Applications for Patents

SULPHUR DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Feb. 23. (Switzerland, Feb. 25, '33.) 5980.

PRIMARY DITERPENE-ALCOHOLS, manufacture.—Soc. of Chemical Industry in Basle. Feb. 27. (Switzerland, March 3, '33.) 6351.

HEAVY HYDROGEN, obtaining.—J. Tutin. Feb. 28. 6403.

TITANIUM PIGMENTS.—Titanges. Feb. 23. (Germany, Feb. 23, '33.) 6035.

WETTING, ETC., AGENTS.—A. W. Baldwin, I. M. Heilbron, and Imperial Chemical Industries, Ltd. March 5. 6951, 6954.

GLYCEROL ETHERS.—A. W. Baldwin, I. M. Heilbron, Imperial Chemical Industries, Ltd., and W. E. Jones. March 5. 6953.

STABLE CELLULOSE NITRATES, manufacture.—E. Berl. March 3. 6815.

REMOVAL OF CHLORINE, etc., from waste gases.—E. Berl. March 3. 6816.

MONOAZO DYESTUFFS, manufacture.—Chemical Works, formerly Sandoz. March 1. (Switzerland, March 7, '33.) 6632.

DERIVATIVES OF KYRIDYLAMINES, manufacture.—Chemische Fabrik on Heyden Akt.-Ges. March 7. (Germany, March 8, '33). 7273.

PREPARATIONS having an antiemetic action, manufacture.—Chemische Fabrik Von Heyden Akt.-Ges. March 7. (Germany, March 8, '33). 7274.

PREPARATIONS having an antiemetic action, manufacture.—Chemische Fabrik Von Heyden Akt.-Ges. March 7. (Germany, March 29, '33.) 7275.

DERIVATIVES OF OXY- AND AMINO-PYRIDINE COMPOUNDS.—Chemische Fabrik Von Heyden Akt.-Ges. March 7. (Germany, March 31, '33.) 7276.

COMBINATIONS containing polyvinyl compounds, manufacture.—Consortium für Elektrochemische Industrie Ges. March 7. (Germany, March 8, '33.) 7277.

POLYMERISED VINYL COMPOUNDS, production.—J. W. C. Crawford and Imperial Chemical Industries, Ltd. March 2. 6782.

DETERMINATION of hydrogen ion concentration.—R. A. A. Dru. March 7. (France, March 7, '33.) 7310.

VULCANISATION ACCELERATORS, etc.—E. I. du Pont de Nemours and Co. March 5. (United States, March 3, '33.) 6934.

ISOTOPIC HYDROGEN, production.—A. Farkas, L. Farkas, and E. K. Rideal. March 1. 6616.

VACUUM DISTILLATION.—E. W. Fawcett, Imperial Chemical Industries, Ltd., and J. L. McCoven. March 7. 7287, 7288.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

New Zealand.—A newly-established Auckland firm of agents and importers desires to represent U.K. manufacturers of plastic products, activated carbon, deodorising and other chemicals, for the whole of New Zealand. (Ref. No. 291.)

Argentina.—An agent in Buenos Aires, now visiting England, wishes to secure the representation of U.K. manufacturers of industrial chemicals, boiler feed-water chemicals, etc. (Ref. No. 317.)

Poland.—A firm in Warsaw is desirous of securing the representation of U.K. exporters of gelatine (for edible and technical purposes in powder and leaf), gum arabic, carnauba wax, carbon black, sulphur, etc. (Ref. No. 308.)

Portugal.—An agent at Oporto wishes to obtain the representation of U.K. manufacturers of chemicals in bulk. (Ref. No. 309.)

Sweden.—An agent at Tenhult wishes to obtain the representation of U.K. manufacturers of chemicals, colours and varnishes. (Ref. No. 310.)

Forthcoming Events

Mar. 19.—Society of Chemical Industry (Yorkshire Section) and Institute of Chemistry (Leeds Section). Annual general meeting of the Yorkshire Section of the Society of Chemical Industry. "The Oiling of Wool and Other Fibres." Dr. J. B. Speakman, Professor A. T. King, E. V. Hayes Gratze, Dr. S. G. Barker. 7 p.m. The University, Leeds.

Mar. 19.—Institution of the Rubber Industry. "Recent Developments in the Preparation of Rubber and Preserved Latex of Direct Interest to the Manufacturer." G. Martin. The Reynolds Hall, College of Technology, Manchester.

Mar. 20.—Society of Dyers and Colourists (Huddersfield Section). "Modern Developments in Textile Chemicals for Dyeing and Finishing."

Mar. 20.—Hull Chemical and Engineering Society. "Corrosion from the Metallurgical Standpoint." K. G. Lewis. 7.45 p.m. Grey Street, Park Street, Hull.

Mar. 20.—Midland Metallurgical Societies. "Rolling Mill Practice." G. W. Russell. 7 p.m. James Watt Memorial Institute, Great Charles Street, Birmingham.

Mar. 20.—Institute of Chemistry (Belfast Section). "Paper Manufacture." H. T. Currie. 7.45 p.m. Royal Belfast Academical Institution, Belfast.

Mar. 21.—British Association of Chemists (Manchester Section). Annual meeting and section annual dinner. 6.30 p.m. Engineers' Club, Manchester.

Mar. 21.—Institute of Chemistry (Huddersfield Section). Annual general meeting and an exhibition of industrial films.

Mar. 21.—Electrodepositors' Technical Society. Second William James Memorial Lecture, by Professor R. S. Hutton. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.

Mar. 21.—Institution of the Rubber Industry (Scottish Section). "Works Costing Systems." W. Lundie. 7 p.m. Elmbank Crescent, Glasgow.

Mar. 21.—Society of Glass Technology. 2 p.m. Stourbridge.

Mar. 21.—Institution of Chemical Engineers. Joint meeting with the Institution of Petroleum Technologists. "The Practical Testing of a Continuous Petroleum Still." A. H. Goodliffe. "The Determination of Plate Efficiency in Fractionating Columns for Complex Mixtures." A. J. V. Underwood. 6 p.m. Burlington House, Piccadilly, London.

Mar. 22.—The Chemical Society (Birmingham). Annual general meeting. 4 p.m. The University, Birmingham. Anniversary dinner. 7.30 p.m. Grosvenor Rooms, Grand Hotel, Birmingham.

Mar. 23.—Society of Dyers and Colourists (Scottish Section). "Tar, the Genesis of Dyestuffs." Thomas A. Wilson. 7.15 p.m. George Hotel, Buchanan Street, Glasgow.

Mar. 23.—West Cumberland Society of Chemists and Engineers. Annual general meeting and smoker. 7 p.m. Workington.

Mar. 23.—Manchester Literary and Philosophical Society (Chemical Section). Annual general meeting. "Modern Oil Engines." B. J. Tams. 36 George Street, Manchester.

New Companies Registered

British Cod Liver Oil Producers (Hull), Ltd.—Registered as a private company on March 2. Nominal capital £50,000. Producers and distillers of and dealers in oils and other products from all kinds of substances, whether or not composed of or extracted from fish, parts or contents of fish or fish refuse; manufacturers of and dealers in fish oil and other fish products, fuels, fertilisers, meals, oils, manures and feeding stuffs, oil merchants and blenders, manufacturers of and dealers in greases, lubricants and glues, manufacturing chemists and druggists, makers of cleansing solutions, soap boilers and candle makers, etc. Directors:—Thomas Boyd, "Dunvegan," Heads Lane, Hessle Edward Cargill, James Clark, Harold W. Hall, Harry M. Harrison, Frank O. Hellyer, Owen S. Hellyer, Thomas Hudson, Thomas Hudson, John W. Town, P. Ross, Albert Turgoose, Chas. G. Wellsted, W. R. Wilson.

London Water Softeners, Ltd.—Registered March 9. Nominal capital £200. Manufacturers of and dealers in filtering and purifying apparatus, plant and preparations, water softening plant, materials and preparations, etc. A subscriber: Joan Armstrong, 116a Elm Road, New Malden, Surrey.

Permastic, Ltd., 39 Lombard Street, London, E.C.—Registered March 8. Nominal capital £30,000. Manufacturers of and dealers in all or any articles manufactured or derived from any form of plastic materials, including articles manufactured from plastic materials produced from a combination of phenol and formaldehyde in amalgamation or physical association with any other chemical substances, etc. Directors: Clive Nuttall, and Joseph Maudsley.

Company News

Staveley Coal and Iron Co.—An ordinary interim of 2½ per cent., tax free, the same as a year ago, has been declared.

International Nickel Co.—A quarterly preferred dividend of 1¾ per cent., is announced payable on May 1.

Tehidy Minerals.—There was a profit for the past year of £9,083, against £5,974 in the previous year. The amount carried forward is £7,203.

Celanese Corporation of America.—A quarterly dividend of $1.75 per share is announced on the 7 per cent. cumulative series prior preferred stock, payable on April 1.

International Salt Co.—The net earnings for 1933 are stated to be $2.04 per share, on shares of stock, compared with $514,684, or $2.14 per share for 1932.

Dominion Tar and Chemical Co.—For the year 1933 the report shows combined earnings from operations before depreciation and tax, $475,057. The balance of surplus at December 31 was $589,188.

Canadian Celanese Co.—A quarterly dividend of $1.75 per share on the 7 per cent. cumulative participating preferred stock and a further dividend of 75 cents per share on account of arrears, both payable on March 31.

Viscose Development Co.—A net profit of £5,046 is shown for the year 1933. The directors recommend a dividend of 4 per cent., less tax, on the ordinary shares, placing to reserve £1,000, to reserve for tax, £600, leaving to be carried forward, £683.

English Clays, Lovering, Pochin and Co.—The first report, covering the period October 14, 1932, to September 30, 1933, shows a trading profit of £32,301. After interest, fees, depreciation and an interim payment on preference shares, £5,633 is carried forward.

Vick Chemical Co.—The net profit for the year 1933 is reported to be $2,339,296, equivalent to $3.34 a share of capital stock and scrip, including 15,975 shares to be issued for capital stock of Drug, Incs., not presented for exchange.

Evans, Sons, Lescher and Webb.—The report for the year 1933 states that the trading profit, before tax provision, is £32,696. The directors propose to transfer to general reserve £10,000, to pay six months' dividend on the 6 per cent. preference shares, less tax, leaving to be carried forward £3,040.

United States Steel Corporation.—Gross receipts of $524,969,000 are shown in the 1933 statement. Total earnings were $17,991,000, and the deficit (before dividends) $36,501,000. After the payment of preferred dividends the total deficit was $43,707,000 compared with $91,892,000.

United Drug Co.—The net earnings for the year 1933 were $647,789, equivalent to 46 cents per share. The figure includes a profit of $868,086 on bond retirement, but not the profit on the sale of Boots' stock and the operating deficit of the Liggett drug store chain, now in receivership.

British Aluminium Co., Ltd.—The accounts for 1933 show a profit of £162,830, including £49,872 brought forward, and after making provision for taxation, debenture interest, and setting aside £50,000 to depreciation reserve. The directors recommend a dividend of 5 per cent. for the year on the ordinary shares, leaving £52,778 to be carried forward.

United Turkey Red Co.—A loss is shown for the year 1933 of £8,400. After deducting credit balance of £1,995 brought in, a debit of £6,405 is carried forward. The directors recommend that dividends on the 4 per cent. first and 5½ per cent. second cumulative preference shares be paid on March 29, and charged against reserves. No ordinary dividend is to be paid.

International Paint and Compositions Co.—A trading profit of £146,151 is announced for 1933, against £142,891 in the previous year, while the total figure is up from £198,959 to £203,669. The balance after debit, tax and depreciation charges is reduced from £102,362 to £91,209. The reserve transfer is maintained at £20,000. The ordinary dividend is maintained at 9 per cent., and the carry-forward raised slightly, to £16,194.

Amalgamated Zinc (de Bavay's).—For the half-year ended June 30, 1933, the report states that the income for the period amounted to £5,575. After deducting £573 Broken Hill compensation, £625 provision for tax, and usual administrative charges, the net profit amounted to £3,105, to which is added a further transfer from equalisation reserve £1,895, making £5,000. Since the close of the half-year, a further dividend (No. 53) at the rate of 5 per cent., per annum, absorbing £5,000, was paid on October 6, 1933.

Pinchin, Johnson and Co.—The company reports a profit for 1933 of £250,956, compared with £220,997 in 1932. Tax provision is reduced from £63,000 to £43,000, so that the net balance is up from £157,997 to £207,956. The interim ordinary payment of 6 per cent. in September compared with 7½ per cent. in 1932, and the directors now recommend a final dividend of 9 per cent., so that the total distribution is maintained at 15 per cent., less tax. After this payment, the amount carried forward is raised from £47,053 to £48,330.

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